

# *The* **Alabama Poultry Engineering and Economics**

Auburn University

## NEWSLETTER

No 2. October 1999

*The first mailing of the Alabama Poultry Engineering and Economics Newsletter went out in August, and it seems was very well received. The calls, letters and cards encouraging us to continue this effort have been much appreciated. We recognize the need for timely, accurate, and unbiased information on poultry housing management and economics and our goal is to provide this to poultry producers, live production personnel, and allied industry representatives. We also want input from our readers. If you like what you see, let us know. And please pass your copy on to a colleague, neighbor or friend and get his or her name on our list. If we miss the mark on a topic or you have a comment, let us know that. If there is a particular topic that you think we should take a look at in a future issue, tell us about that as well, we will see what we can do. – The Editors*

### Feature article

## Coping with Cooler and Up-and-Down Weather

It has been a long, hot, dry summer in many poultry areas in the U.S. "Class A" houses with tunnel ventilation and evaporative cooling performed extremely well. Retrofits to tunnel with evaporative cooling continued at a rapid pace throughout the country. We have a lot of good data as to the benefits of these new housing types over conventional – but that is a topic for another issue. In this article, let's consider broiler house ventilation management in the kind of changeable weather we encounter in fall or spring.

As cooler weather sets in we need to be changing our mindset as we approach production and ventilation. It is not uncommon for temperature to swing from 48<sup>o</sup>-50<sup>o</sup> F at night to 80<sup>o</sup>-85<sup>o</sup> F in the day in many of our production areas. We are no longer fighting extreme heat in our program, but having to cope with daily up-and-down weather. This time of year offers the greatest potential for maximizing gain and growth at minimum costs if we know how to achieve desired temperatures in the house. But most experts agree this is a tough time to manage ventilation because the conditions are constantly changing.

Outside temperatures greatly influence in-house conditions and ventilation requirements. To keep in-house temperatures steady and in the range best suited to bird growth when outside weather is very changeable takes an attentive operator on the

site. Often, a daytime hot-weather tunnel setup must be changed to a night-time cold-weather mode and then back again to hot-weather the next morning, and so on. The challenge for a poultry producer is in recognizing the times when the system setup needs to be changed and in managing the transition smoothly.

Our goal in ventilation is to keep in-house temperatures at the right levels for the birds throughout the grow-out. The "optimum temperatures" graph (see inside) shows the approximate daily temperatures that are most often found to produce the best broiler feed conversion and weight gain as a grow-out progresses. In using a graph

like this as a guide, we must remember that the temperatures shown hold only for still air. That is, the graph does not take into account any wind-chill effect from moving air over the birds. It is best to read the temperatures as approximate *effective* or *equivalent* temperatures needed. Note that the younger the birds are, the narrower the critical temperature range is. Bird needs change as they grow, however, and ventilation needs to be managed throughout the cycle to meet these changing bird needs.

The *effective* or *equivalent* temperature felt by the birds depends on the velocity of the air flowing over them. Tunnel ventilation works for hot conditions because it produces a wind chill effect, so the birds feel an effective temperature that may be ten to fifteen degrees lower than the thermometer reading. How much wind-chill the birds experience depends partly on air temperature (by the thermometer). In

**This time of year offers opportunity for maximum bird performance at minimum cost – if ventilation is managed well.**

**Key to getting consistent top bird performance is recognizing when the system setup needs to be changed and managing the transition smoothly**

**What matters is the temperature the birds experience – which can be very different from the thermometer reading.**

cooler air, the wind-chill is greater. Wind-chill begins to fall off as temperature rises into the mid to upper 90°F range. At any air temperature, younger birds will experience much greater wind chill. The wind-chill chart on the facing page shows the big differences in equivalent temperature experienced by 7-week vs 4-week birds.

In changeable weather, birds often need high-velocity tunnel cooling during the day, when temperatures get into the 80's. But as the outside temperature begins to drop in the afternoon and evening down into the 70's, 60's, and below, continuing to run tunnel ventilation can cause birds great discomfort and get in your pocketbook. The challenge for ventilation management comes under such conditions when we need to remove heat from the house, but moving *cold air* directly over the birds is likely to produce *chill stress* and seriously reduce performance. This problem is most likely to occur in "in-between" and changing weather conditions, and also with birds in the "in-between" growth stage when we are past the brooding phase but birds have not grown very large.

**The wind-chill equivalent temp for young birds is much lower than it will be for older, larger birds.**

The solution is to change the ventilation setup to bring air in through the sidewall vent boxes, which allows for bringing in fresh air and removing heat from the house but does not put the outside cold air directly on the birds. To get more heat removal than is possible with the minimum-ventilation setup, we can use the tunnel fans in this setup instead of the sidewall exhaust fans. This relatively new ventilation method, called "transitional ventilation," is helping many growers better manage challenging up-and-down or in-between conditions.

The transitional setup illustration on page 3 shows the airflow pattern that results when we use the tunnel-fan/sidewall-inlet setup. With the tunnel inlets fully closed, we can use up to half of the installed tunnel fans to bring air in through the sidewall inlets. For a 40 x 400 house we need about 50 vents and for a 40 x 500 house 60 vents is desirable. This arrangement allows us to remove just as much heat from the house as would be removed in tunnel ventilation using half of the fans. The difference is that using the sidewall inlets promotes good air mixing and keeps the cooler outside air from flowing directly over and chilling the birds.

**The transitional ventilation setup allows us to remove as much heat as running half tunnel – but without putting cold air on birds.**

The switch to the transitional ventilation setup from minimum ventilation setup can be controlled by a thermostat which overrides the minimum ventilation timer. Tunnel fans are then stated on as needed. For most effective control of the in-house environment, the vent boxes should be on static pressure actuated controllers. These controllers adjust the openings as the number of fans running changes. It is difficult or impossible to make these adjustments manually.

**Static pressure actuated vent boxes are essential for good management in transitional ventilation.**

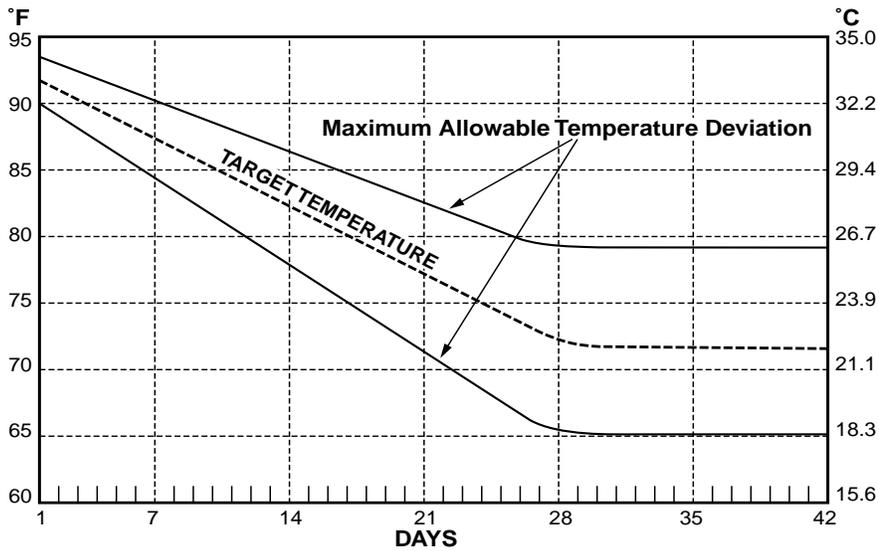
While automatic controllers can be an invaluable help, the controllers and thermostat settings themselves must be kept under good management oversight. It is the grower who has ultimate responsibility for determining the best way to control in-house conditions. You must watch both inside and outside temperatures as well as the birds themselves to judge when changes need to be made. The "in-between" conditions have always been difficult. Now, transitional ventilation fills the gap between cold-weather minimum and hot-weather maximum (tunnel) ventilation. It is a great tool for coping with situations when we need to exhaust house heat but have to avoid putting cold airflow on the birds.

### **The \$ Value of Doing it Right**

Birds can survive over a wide range of temperatures, but just surviving is not enough for us in a modern production program. We need to keep birds within their comfort range, which is a narrower range of temperatures. Within this range their body mechanisms are able to adjust internally to regulate their comfort. However, unless the temperature they experience is within one or two degrees of the optimum, they will still need to expend some feed energy to maintain this comfort, rather than for growth. The bottom line: for a flock of birds at any given time there is a precise temperature at which birds will use the minimum amount of the calories from their feed to maintain their body and the largest amount of feed energy to growing and producing meat. This best-performance temperature changes from day one to catch and is affected by wind speed, litter temperature and other factors. It is a complex relationship that is very dynamic, and changeable from flock to flock.

**At any given time there there will be one precise best-performance temperature for a given flock.**

Relatively small temperature differences can have a significant effect on returns to the grower. This has been well confirmed by research and by experience under U.S. conditions. The "value of being on target" graph

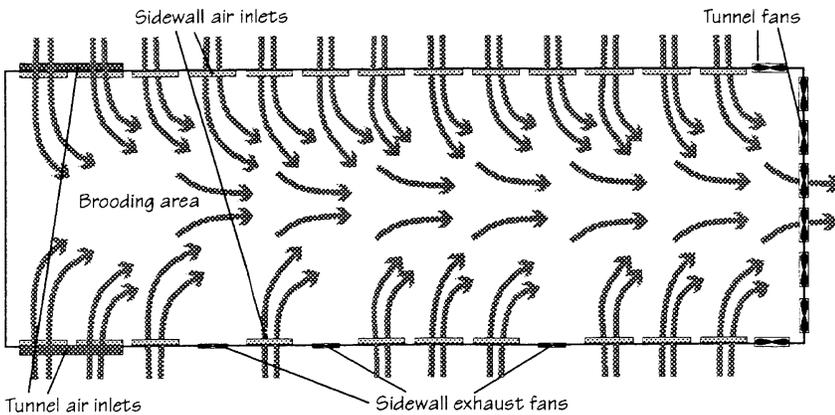
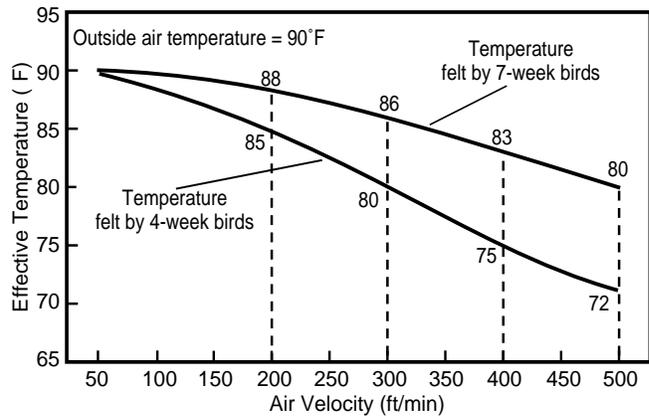


**Optimum temperatures for best broiler performance**

Use as a general guide only; exact optimum temp varies from flock to flock, etc. Caution: If there is air movement on birds (as in tunnel ventilation), they will experience an equivalent temperature lower than thermometer reading. Therefore, interpret graph in terms of bird equivalent temperature. In a modern tunnel house, good management should be able to achieve much closer temperature regulation than the "maximum allowable" deviations shown, and get a considerable payoff for doing this.

**Wind-chill equivalent temperatures by bird age and air velocity, for outside air temperature of 90° F**

Younger birds will experience greater wind-chill effect than older, larger birds under any circumstances. Growers must use caution in tunnel-ventilating with young birds. Generally, wind-chill effect is greater for cooler air, and starts to drop off as temperature rises into the mid to upper 90's F.

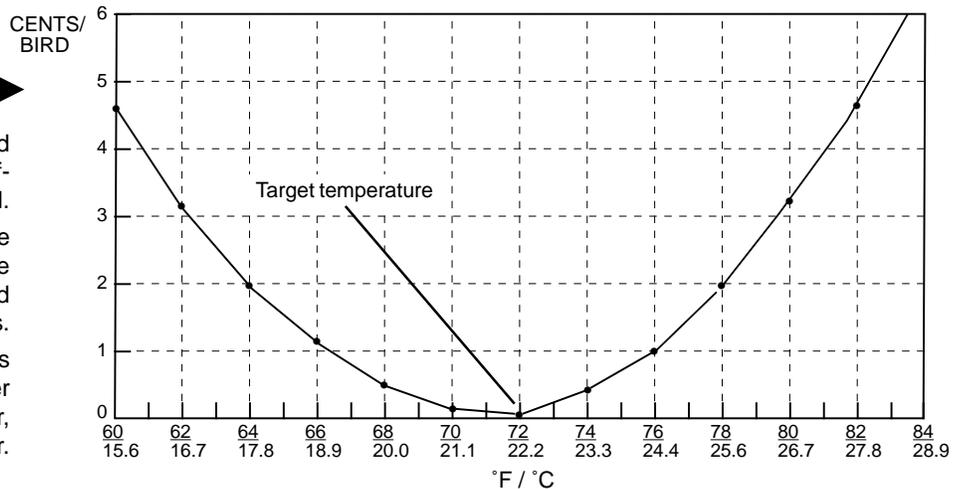


**Airflow pattern generated by transitional ventilation setup.**

With adequate sidewall vent boxes, we can use up to half of the installed tunnel fans to remove large amounts of heat from the house, without putting any cold air directly on the birds. Vent boxes should be on static pressure controllers. Tunnel inlets must be completely closed.

**Cents-per-bird value of being on target temperature**

Chart shows differences in total bird value for consistent on-target vs off-target temperature control. Chart covers only non-brooding phase birds. Consistent on-target temperature control over an entire growout would give even greater returns. Based on a computer study of broilers grown to 49 days, sold at \$0.40 per pound; feed costs \$278/ton starter, \$270/ton grower, \$258/ton finisher.



on page 3 shows differences between on-target and off-target total per-bird value, based on a computer study of temperature effects on feed efficiency. As you can see, missing the target temperature on the high side by only four degrees would mean a one-cent per bird loss in value. But this isn't even the whole story, because this study applies only to the non-brooding growing stage after the target temperature has leveled off. Since maintaining optimum temperature is even more critical in the earlier phase of a growout, the reward to a grower for being consistently on target would be even higher for an entire growout. It's also worth noting that the graph shows bird performance is more quickly hurt by too-high than by too-low temperature. The cost (in loss of total bird value) of being consistently too high by eight degrees F is about half again as much as the cost of being consistently too low by the same number of degrees.

**Staying consistently on target temperature can boost total bird value and return to the grower – just do the math to decide if it's worth the effort.**

The ventilation system is our tool to manage this aspect of production. The grower's ability to detect where his birds are in relation to their comfort zone and to manage the ventilation system to provide the conditions they need for best performance is a major key to getting top returns, flock after flock. To accurately judge a flock's needs, a grower needs to be a good old-fashioned animal husbandman, as almost all our broiler producers are. Managing a modern tunnel-ventilated house, however, takes catching on to the huge difference being able to control air movement makes. Especially to producers just making the move to tunnel and transitional ventilation, this can come as a revelation. At a recent grower meeting, one grower's comment was "*I had no idea how important wind speed is in determining comfort of my birds! It is not just the thermometer temperature that counts. It is the combination of the thermometer temperature and air movement that really determines bird comfort.*" Right on! And this man was of course smiling as he made the remark, realizing also what being able to control that air movement could do for his bottom line.

#### Newsletter Notes –

✓ Coming up in our next issue: How temperature loggers – devices that make a graphic record of temperature changes in a house over time – can help growers evaluate and fine-tune their ventilation management. Also we'll take a look at simple test instruments that can help a producer get the best out of his ventilation system, and spot problems that might otherwise never be detected.

✓ We are inviting allied industry companies to become corporate sponsors, helping us cover publishing and mailing costs. We pledge, of course, that the newsletter will maintain its independence as an unbiased source of up-to-date technical information. We expect demand for the newsletter to increase, and we will need this kind of participation to be able to meet the increased costs that will result. Each corporate sponsor will be acknowledged in every newsletter. For more information on corporate sponsorship, contact Jim Donald at the address below.

#### Tunnel House Video Now Available

"Managing Tunnel Ventilated Broiler Houses" is a 25-minute instructional video prepared as a joint project of the University of Delaware and Auburn University. This video provides essential information on how to manage tunnel-ventilated houses effectively under various weather conditions.

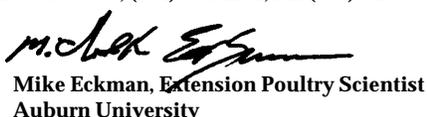
The video explains setups for minimum, transitional and tunnel ventilation; teaches when to be in tunnel mode; and places particular emphasis on understanding wind-chill and the resulting "equivalent temperatures." Guidelines for operating evaporate cooling are presented. Also reviewed are maintenance needs and backup system requirements. The final ten minute segment of this tape answers questions that are commonly asked by tunnel house owners.

To get your copy, contact Jim Donald, Extension Engineer, at the address below. Single copies are \$12.00. Make checks payable to the Biosystems Engineering Department, Auburn University.



The Alabama Poultry Engineering and Economics Newsletter provides up-to-date information on topics of interest to poultry production personnel, focusing on most effective and efficient uses of modern technology and equipment, with a special emphasis on economic implications. The Newsletter is published six times a year, or as needed to address emerging or special issues. Contact: Jim Donald, Extension Biosystems Engineering, 228 Corley Bldg., Auburn University, AL 36849-5626, (334) 844-4181, fax (334)-844-3548, jdonald@acesag.auburn.edu. Published by:

  
Jim Donald, Extension Engineer  
Auburn University

  
Mike Eckman, Extension Poultry Scientist  
Auburn University

  
Gene Simpson, Extension Economist  
Auburn University

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