

# *The Poultry Engineering, Economics & Management* **NEWSLETTER**

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

Auburn University, in cooperation with the U.S. Poultry & Egg and Alabama Poultry & Egg Associations  
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## **The Economic Importance of House and Ventilation Management**

*By John R. Blakely, Aviagen; Gene Simpson, Jim Donald, Jess Campbell, and Ken Macklin, Auburn University*

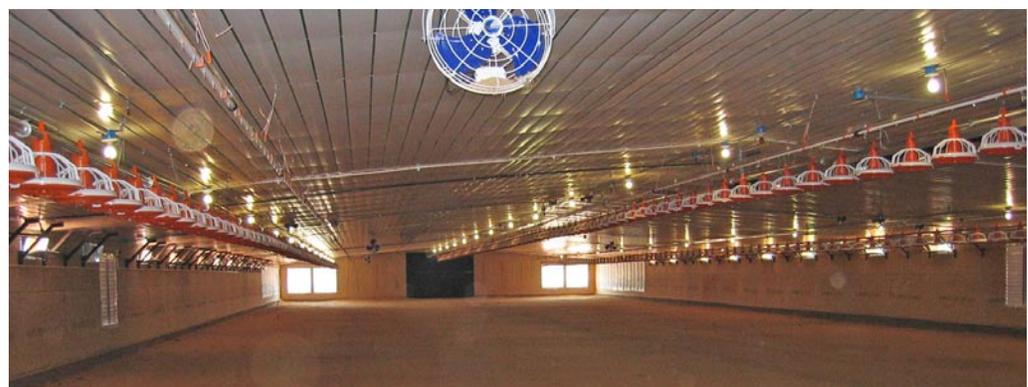
For nearly nine years we have been writing newsletters on many specific housing and ventilation topics. We are often asked why all of these topics are so important and how they all fit together. This newsletter is intended to focus on the answer.

Over time the number of days required for broilers to reach a given target weight has been considerably reduced due to improvements in genetics, nutrition, and management. Additionally, processing body weight requirements have become more precise because of processing plant automation and to meet the changing demands of the market. Though these two factors would seem to promote a simpler route to an improved final product, producing a target-weight broiler in a reduced amount of time can present a challenge to the grower. For example, flock weight differences of  $\frac{1}{4}$  to  $\frac{1}{2}$  lb are commonly seen at target weights of 4.00 lb and 7.50 lb, respectively. These deviations in flock weight occur even though the same genetics and feed source are being used within a production complex.

So why do these differences in target weight occur?

**The poultry houses of the past were not designed or equipped to provide much control over in-house temperature, and the biggest challenge to growers was to avoid heat-induced mortalities.**

**Today, both bird genetics and house design and equipment have been greatly improved, and the grower's challenge is to manage the ventilation system to meet the demands of the modern bird. Failure to maintain consistently optimum in-house conditions, especially temperature, carries a heavy economic penalty.**



Variations in the in-house grow-out environment, highly influenced by ventilation, significantly affect broiler performance. The most critical environmental factor is temperature, and in modern tight poultry housing the “lever” to control house temperature is the ventilation system and the air inlets. As recently as fifteen years ago, in the days of open curtains, no insulation and blow fans, growers had little control over in-house temperature. As negative pressure ventilation techniques were refined, including tunnel ventilation, evaporative cooling and PC-based controllers, it became possible to achieve the very precise temperature control demanded by the modern broiler bird for best performance.

The challenge for the grower is in managing the modern ventilation system to maintain consistent on-target in-house temperature. While problems in drinker or feed systems can certainly affect flock performance, field observations over some years indicate that most often it is failure to maintain optimum temperature that results in sub-optimal flock performance.

### **Growth Rate: Effect on Income**

A common way to compare growth rates between flocks of differing ages in the USA is to calculate the average daily gain (ADG), which is simply the average body weight divided by the age of the flock (in days) at processing. Comparing these figures reveals major differences between growers. For example, in a small bird complex, some flocks will achieve an ADG of 0.10 lb, while others will achieve 0.11 lb per day. The difference in these figures means that one grower will send broilers to the processing plant with an average body weight at 39 days of 3.90 lb, while the second producer will process birds weighing an average of 4.29 lb. For the first flock to equal the second flock, four days of additional growth would be needed.

Differences in growth rates typically experienced in heavier broilers (big birds) are also significant. In one flock, broilers being grown to 7.00 lb achieve an ADG of 0.11 lb. Another flock may achieve an ADG of 0.13 lb. If both flocks were processed at 60 days, one flock would weigh an average of 6.60 lb per bird, while the other flock would average 7.80 lb. At these growth rates, the first flock would have to be grown to 70 days to equal the final average weight of the second flock — a difference of an additional 10 days of grow-out.

Since in reality flocks are usually processed at very similar ages, allowing “additional days” for slower-growing flocks to “catch up” is simply not practical. Growers with broiler flocks experiencing poorer weight gains receive significantly less income. In addition, the company makes significantly less profit from this slower-growing flock. As these examples illustrate, seemingly small differences in growth rate can have very large effects on overall productivity and profitability.

### **Ventilation: Effects on Growth Rate and Feed Conversion**

Changes in the modern broiler bird have increased the importance of in-house environmental factors. In response to market requirements, geneticists have not only raised growth rate, but also the yield of carcass components. The extra meat yield in these birds, most of which is concentrated in the breast, makes the broiler more sensitive to high temperatures; therefore, much of the difference in performance of these birds can be attributed to how well the grower manages in-house environmental conditions, especially temperature.

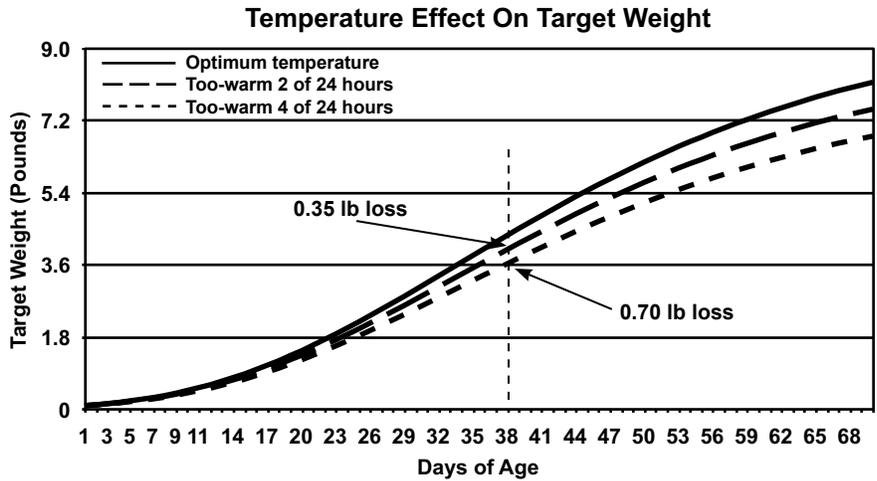
Modern broiler genetic lines have been selected for growth rate, most of which is determined by the bird’s desire to eat. If temperatures are too high, broilers will not eat as much as they could or will not eat at all. Thus, managing in-house conditions to realize the bird’s genetic potential is largely a function of optimizing the ventilation program.

If ventilation system management for temperature control is not ideal for any part of a day, the potential growth for that part of the day is lost and can NEVER be regained.

For example, a 38-day broiler has 912 hours of time to grow. If growth rate deviates from the 4.0 lb target by  $\frac{1}{4}$  lb, or 6.3%, this means that for 6.3% of the time, or 57 hours, the broiler did not grow as well as it could have. Most likely, this decreased growth resulted from numerous periods of several minutes

**Effect of too-high temperature on bird weight.**

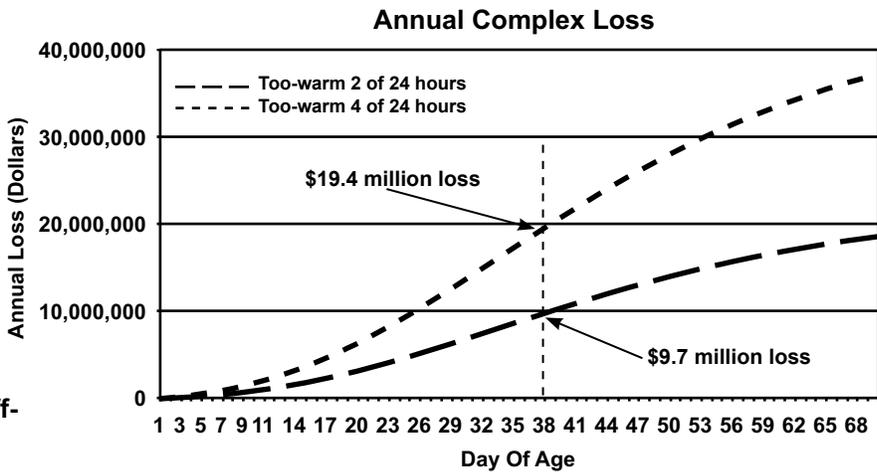
Improper ventilation for any amount of time has an adverse effect on broiler performance. The top curve (solid line) is the expected weight of flocks grown under 'ideal ventilation conditions'. The second curve (dashed line) shows the expected weight of flocks grown under conditions that are too hot for two hours per day. The third curve (dotted line) shows the expected weight of flocks grown under conditions too hot for four hours per day.



The figure shows, for example, that for a 38-day-old bird, the difference in expected weight between optimum environmental conditions and higher temperatures for 2 of 24 hours is 0.35 lb and the difference between optimum environmental conditions and higher temperatures for 4 of 24 hours is 0.70 lb. That represents 10,500 lb of lost weight potential where the optimum ventilation is not maintained for just 2 of 24 hours, for a single house of 30,000 birds.

**Annual company income loss for sub-optimum performance.**

This graph is for a complex where one million birds per week are processed, with 75% carcass yield and a wholesale price of \$0.71/lb. For a 38 day flock age and 7 flocks per year, the annual losses for the complex are \$9.7 million for sub-optimal temperatures lasting only 2 of 24 hours and \$19.4 million when temperature was off-target for 4 of 24 hours. At older flock ages these losses will be even higher.

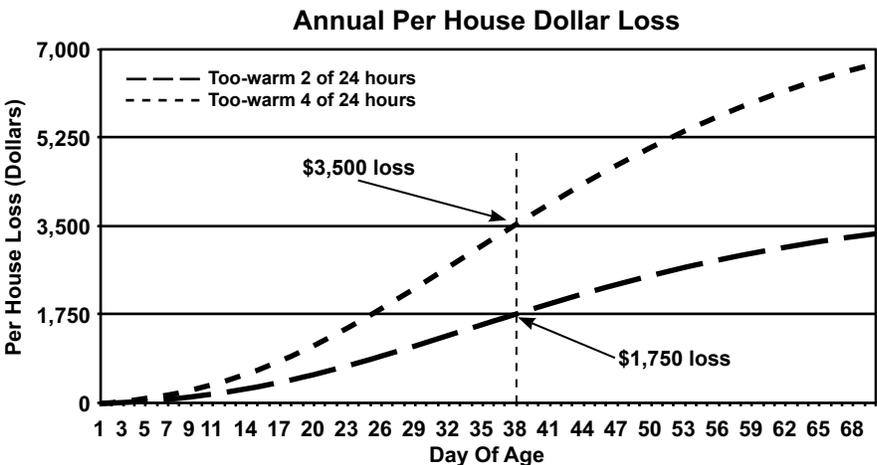


Based on the this information, assuming that only 10% of broiler flocks placed within a company experience these "sub-optimal" conditions, the dollar losses are still very significant.

**Annual per house income loss for sub-optimum performance.**

This figure illustrates a house with 20,000 big birds raised per flock, 5 flocks per year, and a grower payment of \$0.05/lb.

Looking at live weights at 38 days of age, \$1,750 of potential annual income would be lost if temperature was wrong for only 2 of 24 hours and \$3,500 would be lost if temperature was off target for 4 of 24 hours. At older flock ages, even greater economic losses can be expected.



or even hours at a time during which conditions were not ideal. For example, conditions may have been 'off-target' for only 5 hours a day for 11 consecutive days, or an average of only 1½ hours per day for the entire grow-out. Similar calculations can be made for older broiler flocks. We often see these "off target" effects on farm visits.

In addition to decreasing growth rate, temperature problems can also affect performance by elevating feed conversion ratio (FCR). If ventilation problems result in cooler than ideal temperatures, broilers will still eat sufficiently and will grow; however, proportionately more of the energy consumed will go towards maintaining normal body temperature instead of towards growth. In this case, although weight gain will be on-target, the cost of production will be higher because of the elevated FCR. Cooler than desirable temperatures, even for a few hours, increase feed requirements and tend to result in poorer flock performance.

## The Bottom Line

In affecting the broiler's performance by lowering growth rate and raising FCR, ventilation problems greatly affect production cost. Thus, the consequences of improper ventilation are that both grower and company lose money. As the examples in the three figures presented on page 3 show, allowing sub-optimal temperatures for just a few hours a day can cost growers thousands of dollars in annual per house income, and can cost integrators millions.

Modern houses equipped with technologies to enable the management of static pressure controlled ventilation inlets, tunnel ventilation, and evaporative cooling have the potential to work extremely well. However, the producer must properly manage and maintain the ventilation equipment, paying careful attention to detail. Otherwise, bodyweight and/or FCR can be impaired, resulting in significant financial loss to both the grower and integrator.

Clearly, proper ventilation and in-house environmental management programs are essential to minimizing flock weight differences and maximizing profit for both the grower and integrator.

*About Our Guest Author: John R. Blakely is the Eastern US Technical Manager for Aviagen.*



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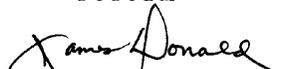
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