Aviagen™ Brief

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The Economic Importance of Ventilation Management: USA Perspective

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Introduction

The amount of time 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 to meet the 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 0.25 lb (115 g) and of 0.50 lb (230 g) are commonly seen at target weights of 4.00 lb (1815 g) and 7.50 lb (3405 g), 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?

Variation in the in-house environment, largely influenced by ventilation, significantly affects broiler performance and the grower is responsible for managing ventilation.

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 (in days) at processing.

Comparing these figures reveals differences between growers. In a small bird complex, some flocks, for example, will achieve an ADG of 0.10 lb (45 g), while others will achieve 0.11 lb (50 g) per day. The difference in these figures means that one grower will send broilers to the processing plant achieving an average body weight at 39 days of 3.90 lb (1770 g), while the second producer will process birds weighing an average of 4.29 lb (1950 g). For the first producer to equal the second four days additional growth would be needed.

Differences in growth rates typically experienced in heavier broilers are also significant. In one flock, broilers being grown to 7.00 lb (3180 g) achieve an ADG of 0.11 lb (50 g). Another flock may achieve an ADG of 0.13 lb (59 g). If both flocks were processed at 60 days, one flock would weigh an average of 6.60 lb (2995 g) per bird, while the other flock would average 7.80 lb (3540 g). 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 10 days in processing age.

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

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 raised not only 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 environmental temperature.

Broiler genetic lines have been selected for growth rate, most of which is determined by their desire to eat. If temperatures are too high, broilers will not eat as much as they could or will not eat at all. Managing in-house conditions is largely a function of optimizing the ventilation program, which can be seen by evaluating grower ventilation management and subsequent bird performance.

If the ventilation (temperature) 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 (1815 g) target by 0.25 lb (115 g), 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 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 1.5 hours per day for the entire grow-out. Similar calculations can of course be made for older broiler flocks.

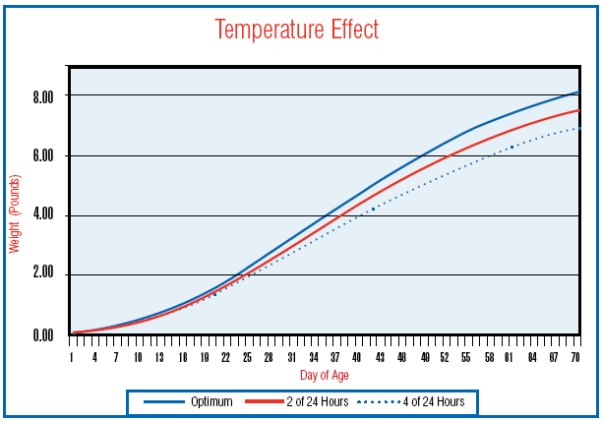
In addition to decreasing growth rate, temperature problems can also affect performance by elevating feed conversion (FCR). If ventilation problems result in cooler than ideal temperatures, broilers will still eat sufficiently and will grow; however, proportionately more of the energy consumed will go towards maintaining normal body temperature instead of towards growth.

In this case, although weight gain will be on-target, the cost of production is higher because of the elevated FCR. Cooler than desirable temperatures, even for a few hours, increase feed requirements and result in poorer performance.

Ventilation: Effect on Cost and Income

In affecting the broiler's performance by lowering growth rate and raising FCR, ventilation problems greatly affect production cost. Therefore the consequences of improper ventilation are that the grower and the company lose money and this is illustrated in the following figures.

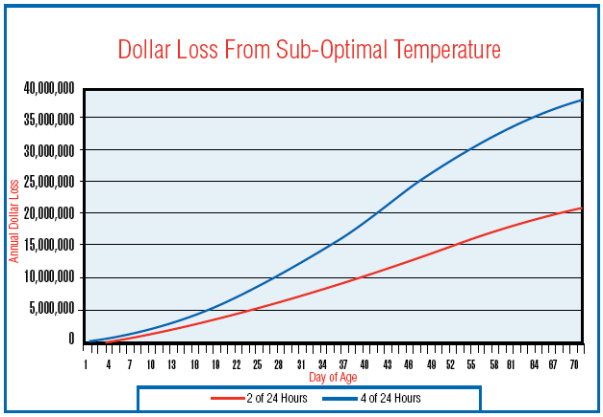
Figure 1 – The effect of increased environmental temperature on performance.



Improper ventilation for any amount of time has an adverse effect on broiler performance and this is illustrated in the previous graph. The top curve (Blue line) is the expected weight of flocks grown under 'ideal conditions'. The second curve (Red 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**.

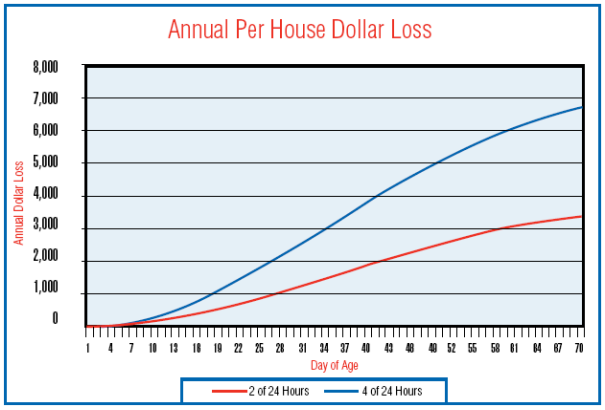
From the data in figure 1, for a 38-day-old bird, the difference in expected weight between optimum environmental conditions and higher temperatures for 2 of 24 hours is 0.35 lb (160 g) and the difference between optimum environmental conditions and higher temperatures 4 of 24 hours is 0.70 lb (320 g). That represents, for example, 10,500 lb (4762 kg) of lost weight potential where the optimum ventilation is not maintained for 2 of 24 hours, for a single house of 30,000 birds.

Figure 2 - The company's loss of income for less than optimum performance.



Further, assume one million birds per week are processed, with 75% carcass yield and a wholesale price of $0.71/lb ($1.56/kg). At 38 days of age, the losses are $9.7 million and $19.4 million, for 2 of 24 hours and 4 of 24 hours, respectively. At older flock ages these losses will be higher. Based on the this information, assuming that only 10% of broiler flocks placed within a company experience these "non-optimal" conditions, the losses are still significant.

Figure 3 - Age related economic losses in one house for less than optimum performance.



Using this information with 20,000 birds per flock placement, 5 flocks per year, and a grower payment of $0.05/lb ($0.11/kg); with the live weights achieved, at 38 days, $1,750 and $3,500 of income would be lost for 2 of 24 hours and 4 of 24 hours, respectively. At older flock ages, these economic losses will further increase.

Conclusion

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

John R. Blakely grew up on a small farm in North Carolina where they began to produce commercial broilers in 1952. After graduating from North Carolina State University with degrees in Agricultural Economics and Poultry Science, he received a Master of Science in Poultry Management from Pennsylvania State University. John has had a varied career in the commercial broiler industry, having worked for several integrated broiler companies and for the last 25 years in the primary breeder business. Currently John is the Eastern Technical Manager for Aviagen in the USA.

Dr. Gene Simpson is a native of Florida and Mississippi. He received his Bachelor of Science in Poultry Science and his Ph.D. in Agricultural Economics from Mississippi State University. He joined Auburn University in 1983 and is currently part of the Agricultural Economics faculty, which he joined in 1998. He develops and conducts educational programs pertinent to economic issues facing the poultry industry.