The University of Georgia

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Cooperative Extension

Poultry Housing Tips

Tunnel Operation Tips for Houses With Young Birds

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It is widely understood that tunnel ventilation is a necessity when it comes to keeping market-age broilers comfortable during hot weather. Air speeds of 600 ft/min or more combined with evaporative pad cooling of ten degrees or more have proven to not only help keep heat stress related mortality to a minimum, but enable the birds to continue to eat and grow during even the hottest summer weather. But, if we want to insure maximum bird performance, health and comfort throughout a flock, tunnel ventilation needs to be viewed as an important tool that producers can and should use any time birds appear heat stressed, whether they are 60 days old or five.

Though tunnel ventilation is in general not required at the beginning of a flock, during periods of extreme heat when house temperatures may be running 5 to 10°F above desired target temperatures and young birds appear heat stressed (i.e, lying stretched out, panting), it use is advisable. The goal in this situation is not to utilize the full cooling potential of a house's tunnel ventilation system, but rather to use just enough tunnel fan and evaporative cooling pad capacity to keep young birds comfortable.

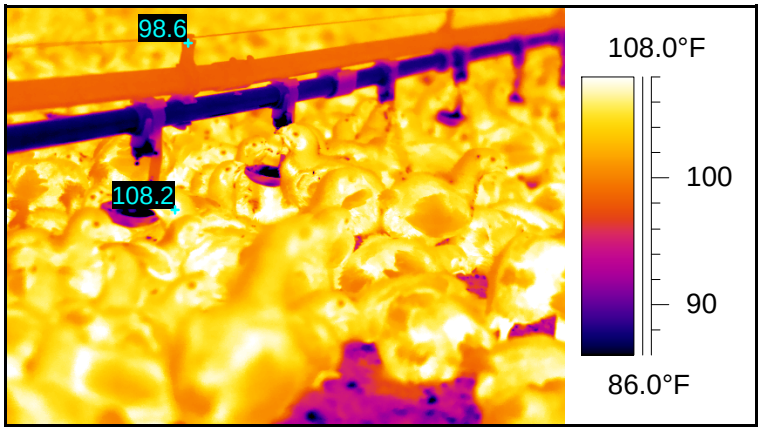

Figure 1. Thermal images of young birds in a house using side wall inlets for ventilation during hot weather.

Figure 2. Heat-stressed young birds (same birds shown in Figure 1).

Figure 1 is a thermal image taken of young birds in a house utilizing side wall inlet ventilation on a very hot afternoon. The house temperature was approaching 100°F and chick ear lobe temperatures, a very good indicator of deep body temperature, were over 108°F. Normally, chicken ear lobe temperatures are a couple of degrees below the normal deep body temperature of approximately 106°F. When they are above 106°F it is very likely the chicks are heat stressed. In this particular incidence this correlation between elevated ear lobe temperatures and deep body temperatures was confirmed by the fact that young birds were panting heavily and laying flat with their wings spread, and very few birds were eating and drinking (Figure 2). Though the likelihood of mortality was low, the fact is bird performance and health in this situation were very likely to suffer.

The following are a few points to keep in mind when using tunnel ventilation with younger birds:

1) Since the total amount of heat produced by a flock of young birds is relatively little, the number tunnel fans required to produce an acceptable air exchange rate is substantially lower than with market-age birds. With market-age birds approximately 9 to 10 cfm/ft^2 of tunnel fan capacity (approximately equivalent to an air exchange rate of once per minute) is required to insure that there is less than a 5^{o}F temperature rise from tunnel inlet to the tunnel fans (Figure 3). Since the total heat production of younger birds is substantially lower than market-age birds, the required tunnel fan capacity is also substantially lower, typically between 1.5 to 3 cfm/ft^2 of floor space. For example, in a 40' X 500' house, approximately 200,000 cfm of tunnel fan capacity may be required (40' X 500' X 10 cfm/ft^2) in a house with market-age birds. When the birds are two weeks old only 70,000 cfm of tunnel fan capacity is typically required (40' X 500' X 3.5 cfm/ft^2). It is important to realize that the minimum tunnel fan capacities depicted in Figure 3 are estimations. Factors such as bird placement density, house construction, insulation levels and outside temperature can affect the required tunnel fan capacity. As a result, the temperature difference from the pads to the fans should be closely monitored and if it exceeds four to five degrees, additional tunnel fan capacity should be utilized.

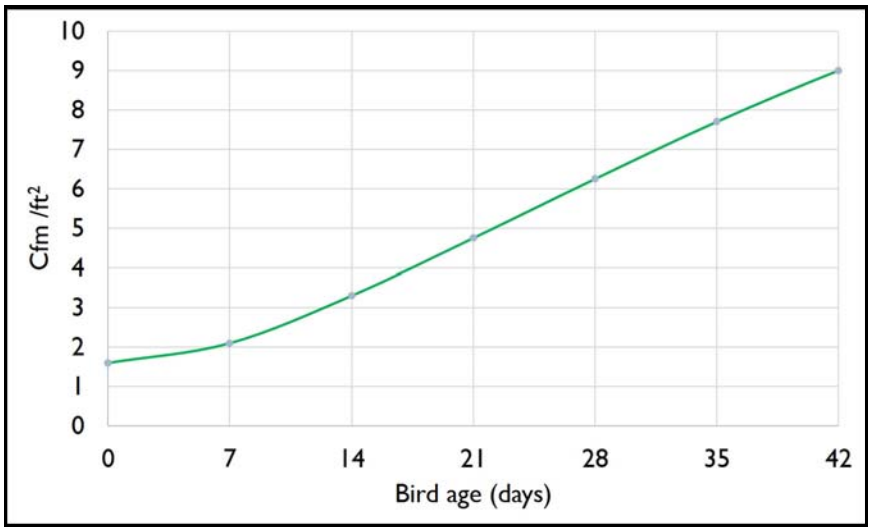

Figure 3. Minimum tunnel fan capacity which should be used when in tunnel ventilation mode as a function of bird age.

2) In addition to obtaining the proper air exchange rate to insure a minimal temperature difference between the tunnel inlet and fan ends of a house, it is equally important that a proper air speed is maintained to insure adequate bird heat removal/cooling. Since young birds tend to be fairly well spread out, have minimal feather cover, and have a high surface area/body weight ratio, very little air speed is required to remove excess heat from the birds to keep them comfortable. As a result, it is generally recommended that air speeds when in tunnel ventilation are kept below 300 ft/min during the first couple weeks of the flock. Producing too much air speed may not necessarily harm the birds when house temperatures are in the nineties, but it can result in excessive energy usage.

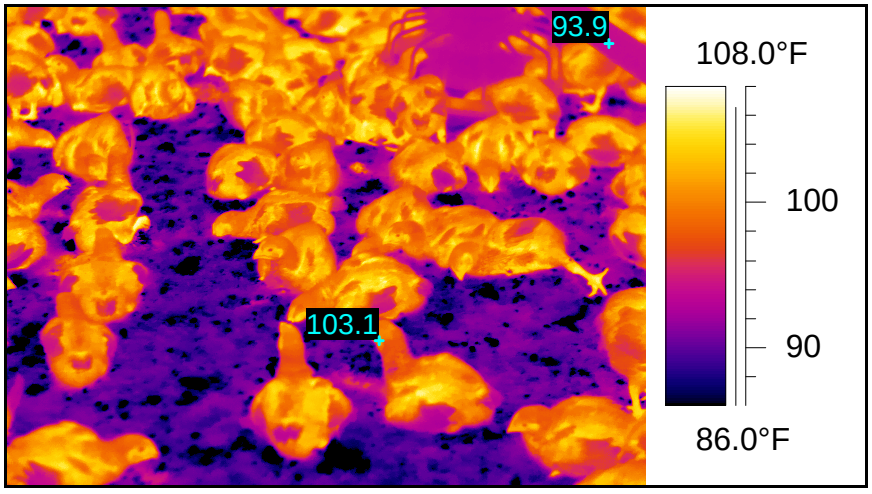

Figure 4. Thermal image of young birds in tunnel ventilation mode.

Figure 4 was taken in the same house shown in Figure 1 fifteen minutes after the house was switched from side wall inlet ventilation to tunnel ventilation. Thirty percent of the houses tunnel fans were operating (1.5 cfm/ft^2) producing an air speed of approximately 200 ft/min. Within a short time ear lobe temperatures dropped below 104^{o}F, the majority of the birds stopped panting and feeding/drinking activity increased.

3) As with older birds it is important that the birds are spread out evenly throughout the house. The greater the amount of space between the birds the lower the amount of air speed required to keep the birds cool. If the birds are in partial house, moving the birds to full house should be considered.

4) Tunnel doors/curtains can be either partially opened or fully opened when tunnel ventilating younger birds. Care must be taken not to close the tunnel doors/curtains too much because it can result in excessive air movement in the tunnel inlet area. If a partial tunnel opening is to be used it should be opened roughly proportional to the number of tunnel fans operating. If one-third of the tunnel fans are being used, then the tunnel doors/curtains should be opened at least one-third of their maximum opening.

5) If the birds still appear heat stressed after switching into tunnel ventilation mode a very limited amount of water should be added to a house's evaporative cooling pads. If too much water is added to the pad system it is very likely that the incoming air temperature will fall below the desired house temperature which can result in tunnel fans turning off, the house transitioning from tunnel back into side wall inlet mode, and possibly even the house's heating system turning on.

To prevent over cooling of the incoming air it is advisable not to operate an evaporative cooling pad system's circulation pumps solely off of house temperature. This is because the amount of cooling produced by a pad system does not instantly stop when the circulation pumps are turned off. When water is added to a dry pad the amount of cooling produced continues to increase over the first ten minutes as water flowing over the surface of the pad wicks into the interior of the pad. Even if the circulation pumps are turned off after operating a couple of minutes or less, the incoming air temperature will continue to fall for another two to ten minutes as water slowly wicks into the interior of the pad.

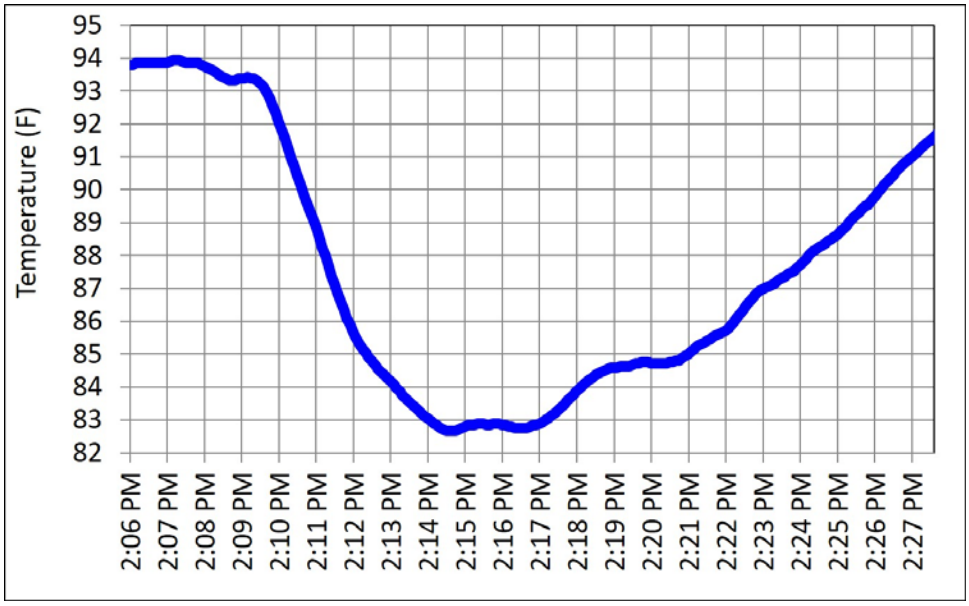

Figure 5. Incoming air temperature in a house where pad system circulation pumps were operated for two minutes (2:09 pm to 2:11 pm)

Figure 5 illustrates how the incoming air temperature will continue to fall even after a pad system's circulation pumps shut off. The incoming air temperature was 94^{o}F prior to the pumps turning on. The circulation pumps were briefly turned on from 2:09 pm to 2:11 pm. Within one minute of the pads turning on, the incoming air temperature dropped approximately two degrees to 92^{o}F. A minute later the incoming air temperature was 89^{o}F and the circulation pumps turned off. Even though there was no water circulating over the pads, the incoming air temperature continued to fall another five degrees to 83^{o}F. Had there been week-old birds in the house this ten-degree reduction in house

temperature would have likely resulted in an over-cooling of the young birds. For the most part with young birds the objective is typically to keep the incoming air temperature from exceeding the low 90's.

To limit the cooling produce by an evaporative cooling pad system it is best, if possible, to wet only one half of the pad on each side of the house. Furthermore, circulation pumps should operate not only based on temperature but an interval timer as well. Once the house temperature becomes excessive circulation pumps should be set to operate less than ten seconds out of very ten minutes. It is better to start with a minimal amount of runtime and increase it after a cycle or two if the cooling is insufficient because if the pad becomes excessively wet it can be difficult for the next hour or more to avoid over cooling of incoming air. Just as with older birds, it is important to keep in mind that air speed is the primary means of cooling young birds and the evaporative cooling system should be used as a secondary tool. Evaporative cooling pads should be used not a substitute for proper air exchange rates and air speed.

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