

The optimum environment for the modern broiler



MICHAEL GARDEN* explains tunnel ventilation, especially the concept of 'wind chill' or perceived temperature that the bird can actually 'feel' through the growing period.

In the extremes of the Southern Asian climate (a tropic, sub tropical region), ambient temperatures can range from between 15C to 45C during the year and the diurnal temperature range (the difference between day and night) can be 20C. Relative humidity, which will affect the apparent temperature the birds feel can range from 30% during hot dry seasons, to 90+% in the hot wet seasons.

Tunnel ventilation is the system of choice for broiler growers in many regions of Asia. The system manages three environmental factors, temperature, relative humidity and air speed.

Often, over-ventilation in the period up to 21 days can negatively impact live weight, FCR and liveability. This is typically characterised by 'CRD' (Chronic Respiratory Disease) issues in the field. Similarly in older birds over 21 days 'heat stress' conditions can be exaggerated by poor ventilation control.

This article will help the producer understand tunnel ventilation, especially the concept of "wind

chill" or perceived temperature that the bird can actually 'feel' through the growing period. We will also see how to use the ventilation system's various components to help produce the optimal environment for the chicken at different stages of its life, from the brooding period through to depletion.

The tunnel ventilation system works on negative pressure and has three different modes to help the broiler grower control the house environment and produce quality chicken economically throughout the diverse climatic seasons of Asia;

1. Tunnel mode is used when the producer needs to keep older birds comfortable in hot and humid environments. It should be used only when the birds are well feathered and over 21 days of age or when house temperature rises above optimum levels.

2. Transitional mode is used for the producer to provide negative pressure ventilation when minimum or tunnel mode can not meet the optimum temperature required for the bird's age. This system uses up to 50% of the total fans available and can incorporate evaporative cooling.

3. Minimum ventilation mode is used in the brooding period in all seasons in Asia, but can also be used when outside temperature is below the optimum temperature required inside the house.

The ventilation system will be supported by the use of a cooling system. This can be cool pads or a fogging system that is controlled by a hygrometer inside the house. Cooling can be introduced in all

modes of ventilation if the outside temperature is higher than optimum temperature required inside the house.

Understanding 'wind chill'

Young chicks do not need and should not be subjected to high airflow or 'wind' speed. Older birds do require high wind speed due to their greater feather cover and the increased heat they produce by the increase in their biomass.

When we read a maximum and minimum dry bulb thermometer in a broiler house, this is a reading of the actual air temperature. The chicken however perceives a different temperature. This perceived temperature is due to wind chill and takes into account dry bulb temperature, air velocity and age of the birds.

Bird behaviour is by far the best guide to 'comfort', not just the dry bulb thermometer reading. There is no single way to predict or calculate accurately what the wind chill effect will be. Table 1 provides a guide only.

A good rule of thumb is to remember that at 4 weeks of age the birds will feel 1.4C wind chill effect per 1200mm fan running.

If the cross section of the house has been reduced with air baffles then air speed should be monitored and fans reduced accordingly.

Bird behaviour

To achieve the bird's optimum biological potential, observation of behaviour is essential. Do not solely rely on monitoring and measuring equipment to adjust the environment within the house.

If the birds are eating and drinking normally and distributed evenly throughout the house, then the environment is correct for their age and requirements.

Birds that are being chilled will be

very inactive and lying very flat in the bedding, huddled together in clumps or hiding behind posts and feeders to get out of the draft being created and that they are feeling.

If the birds are hot and stressed they will be well spread out and panting vigorously. Monitor distribution as they will be moving towards cooler areas for comfort. Differences observed in bird behaviour from one end of house to the other usually indicate poor airflow or other environment imbalance issues within the house.

The grower needs to understand the relationship between humidity and temperature at different times of the day, as this can have a dramatic effect on performance effecting growth and liveability through out the growing period.

In this situation the grower should not turn the cooling on if the relative humidity is above 80%. This is a very important area to understand because a bird loses heat by panting and once the air is saturated with moisture, i.e. high humidity, the chicken will start to overheat and become stressed.

Today's new broiler houses are now controlled by sophisticated computer systems that control and measure the cooling, heating, lighting and ventilation system and display the actual temperature and humidity in the house. However, observation by the broiler manager is vital to ensure the optimum operation of the system.

Older houses can be upgraded

Table 1: Air Velocity and cooling effect.

Metres/second	1 week old (C)	4 weeks old (C)	7 weeks old (C)
0.5	-2	-1	
1.0	-6	-3	-1
1.5	-12	-6	-3
2.0		-8	-4
2.5		-10	-6

relatively cheaply by purchasing electronics which will help monitor and control and thus improve, management of the house environment.

Brooding 0 to 21 days

This period is where the grower needs to supply heat to the chicks, but not at the expense of air quality. The mode of ventilation for this period is minimum or transitional.

Whole house, spot or part brooding systems can be used however the grower must be able to easily monitor chick behaviour and air quality.

Wind speed across the chicks should be 0.3 to 0.6 metres/s in the brooding period and reach around 1metre/s at 21 days of age.

Minimum ventilation mode should be used in the early brooding stage. This normally means running 2 x 1200mm fans fitted on the gable wall. Inexpensive 'cycle timers' should be considered for the purpose of 'minimal ventilation' to avoid fans being on or off for long periods of time and should be adjusted frequently as the biological requirements of the growing birds change.

Cool pads should be covered with winchable curtains or baffle boards and routinely adjusted.

Brooding pens must not be set up near the cooling pads, this is an area where drafts can appear and subject the chicks to chills.

Brooding pens should be expanded towards the gable at the fan end of the house i.e. the warmer part of house. Introduce migration fences, which must not be solid as this will affect airflow or 'wind' direction and velocity to help keep the heat load and biomass distributed uniformly through out the house.

22 days onwards

The birds now are now able to regulate their own body temperature and are well feathered. At this age we need to change the environment to keep the birds cool, which is where we use tunnel ventilation. This system works by using air speed to make the bird perceive it is cooler than it really is, as explained earlier.

All tunnel fans and cooling should be running and if required, wind speed can be increased up to 2.5 - 3 metres/s.

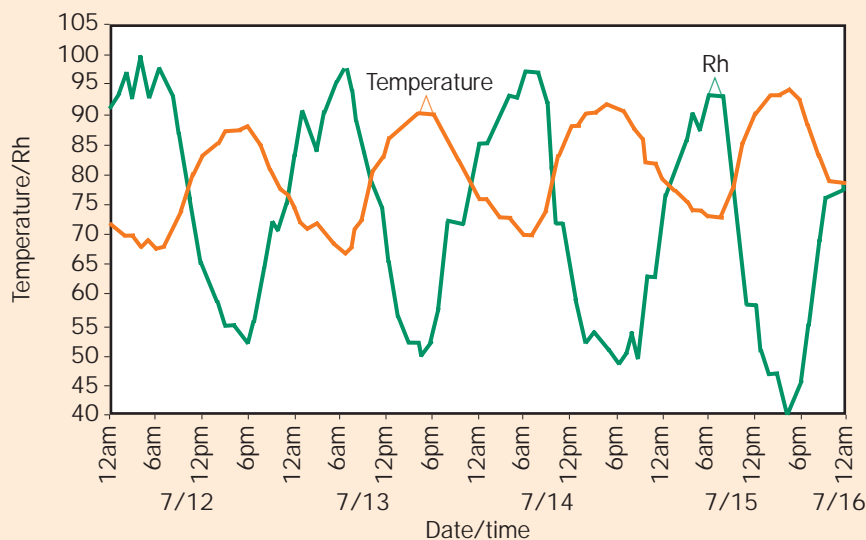
Conclusion

Managing tunnel and evaporative cooling correctly throughout the bird's life will lead to improved production and result in increased profitability.

To achieve this, the grower must use stockmanship skill continuously by monitoring the bird's behaviour and its environment and adjusting ventilation controls to meet the needs of the birds. ■

* Michael Garden (mgarden@aviagen.com) is Technical Service Manager, Asia for Aviagen.

Graph 1: The graph below shows actual temperature and relative humidity recordings in a broiler house over a 5 day period.



Reprinted from