The University of Georgia
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Poultry Housing Tips

Reducing Electricity Costs in Tunnel-Ventilated Broiler Houses

Volume 8 Number 7 **July, 1996**

One of the biggest concerns for broiler producers with tunnel-ventilated houses is power usage. This concern is warranted. The average tunnel-ventilated broiler house has eight, one-horsepower 48" fans and a one-horsepower fogging pump. If a producer were to operate all eight fans 24 hours a day and the fogging pump 12 hours a day for a month, it would cost about $675. Add to this the cost of operating lights, feeder motors, etc. and it is *possible* for a producer to spend $800 or more a month per house for electricity.

An $800-a-month power bill per house is extremely rare. This is because producers do not, or at least should not, run all their fans 24 hours a day for an entire month. The fans and foggers/pads in a tunnel-ventilated house are like the air conditioning system in your car. Though you can set it to maximum cooling all of the time, you will usually be more comfortable if you adjust the level of cooling to outside temperature and how you are dressed. If it is 95°F outside and you are wearing winter clothes, a maximum cooling setting is probably desirable. But if you were wearing shorts and a tee-shirt a lower setting would probably be desirable. In a tunnel-ventilated house the birds are not "dressed" the same way all the time. Different age birds require different amounts of cooling and maximum cooling is typically needed for only the oldest of birds. And there lies the key to keeping power costs to a minimum in

Figure 1. Two-week-old birds - natural ventilation

Figure 2. Two-week-old birds - tunnel ventilation

a tunnel-ventilated house--adjusting the level of cooling to the age and feathering of the birds. You want to provide enough cooling to keep the birds comfortable and eating, but not so much as to harm feed conversions and cause excessive energy usage.

With large birds, the number of fans used in a tunnel-ventilated house is based on obtaining a windchill effect of 10 to 12°F and keeping the temperature difference between the inlet and the fan ends of a house within five degrees. To obtain these goals, an air speed of about 400 to 450 ft/min and an air exchange rate of about once a minute is needed. This requires eight to nine 48", 19,000 cfm fans in the average 400' to 500' dropped ceiling, broiler house (Figures 3 and 4). With younger birds, not as many fans are required to obtain these same goals. As discussed in previous newsletters (*Windchill Effect. Poultry Housing Tips, June 1996*), less air movement is required to produce a 10 to 12°F windchill effect for younger birds because they are poorly feathered, and the birds are more spread out, making it easier for air to flow over all the surfaces of the birds (Figure 3). Air temperature rise is less with small birds because they produce less heat than large birds (Figure 4). Therefore, less air exchange is required. For instance, a four-week-old bird produces only about half the amount of heat as a seven-week-old bird. Since only half the amount of heat is produced, the air exchange rate can be reduced by about half.

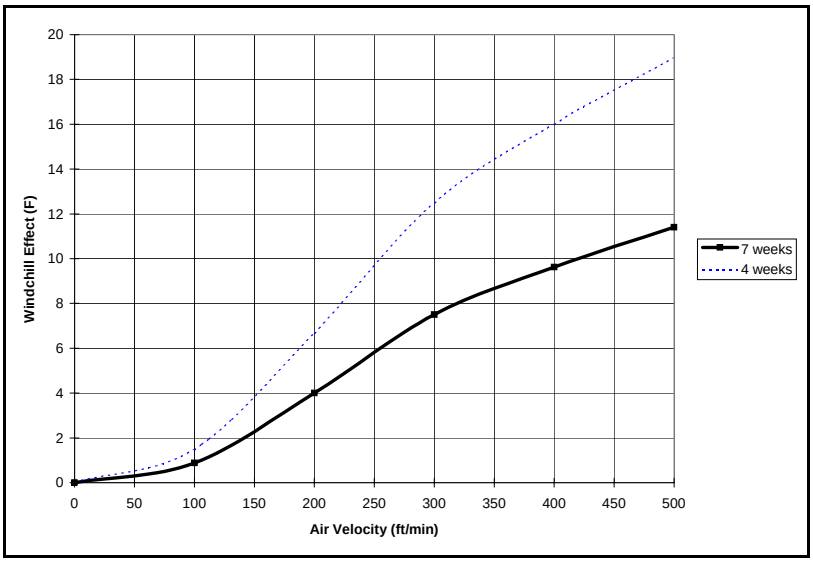

Figure 3. Windchill effect for seven and four-week-old birds.

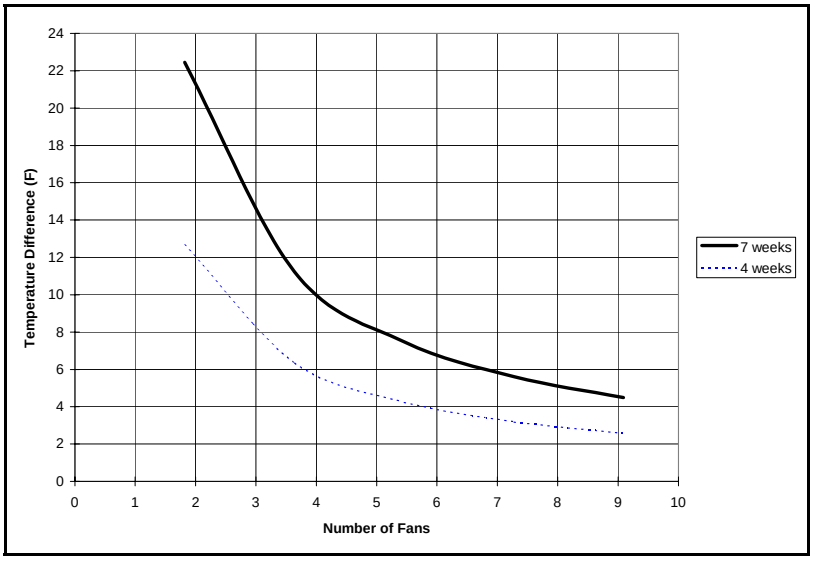

Figure 4. Temperature rise in average tunnel-ventilated house with different numbers of 48" fans operating.

So how many fans should a producer use? In the average house (40' x 400'-500', dropped ceiling, eight to nine 19,000 cfm 48" exhaust fans) a producer can often limit the number of fans operating to one more than the age of his birds in weeks. This number of fans will produce approximately a 10 to 12°F windchill effect and the temperature difference between the inlet and fan ends of a house should be less than five degrees. The fans should be operating by the time house air temperature is ten degrees above the desired house temperature. For instance, if you have four-week-old birds and your desired house temperature is 73°F, five fans should be running by the time house temperature reaches 83°F. With the ten-degree windchill effect produced by the five fans, the effective house temperature would be about 73°F. If house temperature continues to rise, evaporative cooling should be used.

Two identical 40' X 400', tunnel-ventilated, dropped ceiling houses, with eight slant-wall 48" fans and 2" paper fogging pads were recently compared. The birds were 14 days old and it was 95°F outside. One house was using natural ventilation and the other was using tunnel ventilation. Your first thought may be that a 14-day-old bird is too young for tunnel ventilation. You would be right, if your concept of tunnel ventilation is all eight fans and

fogging nozzles running. But this is not how the producer was operating the tunnel-ventilated house. The desired house temperature for the two- week-old birds was 78ºF. When the house temperature reached 88ºF the producer was running three of his eight 48" fans. Since three fans will produce about a 10ºF windchill effect for a two-week-old bird, the effective house temperature is approximately 78ºF. At 89ºF, his controller turned on his fogging pad system. Like the fans, not all the cooling potential of his system was used. He used two lines of fogging nozzles on his pad operating at line pressure. When the house temperature dropped to 87ºF, the fogging nozzles shut off.

In the house using natural ventilation, the air temperature was approximately 95ºF and virtually all the birds were panting (Figure 1). In the house using tunnel ventilation, the air temperature was between 86 and 89ºF (with the 10ºF windchill effect the effective house temperature was in the high seventies). The temperature rise from the fan to the inlet end in the tunnel-ventilated house was approximately three degrees and only a few of the birds were panting (Figure 2). Though it is true the birds were not going to die in the house using natural ventilation, they were uncomfortable and probably eating less. By using tunnel ventilation the birds were kept comfortable and eating for about 30 cents an hour. Later that evening when outside temperature dropped the producer could have used either side wall inlet or natural ventilation.

Using fogging pads in house where only a few exhaust fans are operating is fairly easy. In houses where only interior fogging nozzles are used you have to be a little more careful to avoid house wetting. One way to minimize house wetting is to use only those nozzles in the vicinity of the tunnel curtain and adjusting the tunnel curtain so that a static pressure of 0.05" is obtained when the fogging nozzles are used.

The concept of using one more fan than the age of the bird and then using evaporative cooling is not foolproof. You have to watch your birds. If they look hot, i.e., a significant percentage of the birds panting, you should use more fans. If the temperature difference between the inlet and fan ends of the house exceeds five degrees you should use more fans. But by running only the fans required to do the job, you may find that you can both increase bird performance and reduce operating costs at the same time.

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