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Poultry Housing Tips

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Average House Temperature

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The temperature of air in a tunnel-ventilated house increases as it travels from the inlet to the fans. The increase in air temperature is caused by the addition of heat coming from the building surfaces (i.e., curtain and ceiling) as well as from the birds. How much of a temperature difference a producer will see between the two ends of a tunnel-ventilated house depends on how much heat is added to the air as well as how many fans are operating. For instance, if a house has large birds producing a lot of heat and only a few fans are operating, a grower would expect a fairly large temperature difference (ten degrees or more). But, if a producer had small birds producing little heat and all the fans were operating, the temperature difference would be very small, less than a degree or two.

It is not practical to install enough fans to totally eliminate the temperature difference between the inlet and fan ends of a tunnel-ventilated house. The best we can do is install enough fans so that on a hot summer day with large birds in the house and all the fans operating, that the temperature difference between the two ends of a house is kept to within three to five degrees. This requires approximately 170,000 cfm for a 40' X 500' house and 150,000 cfm for a 40' X 400' house. Although a three to five degree temperature difference can be a nuisance, it will typically have a negligible effect on bird performance.

Since temperature differences in a tunnel-ventilated house are unavoidable an important question becomes where thermostats or controller sensors should be located. One school of thought used in houses with environmental controllers is to use an average of temperature sensors located at the front, middle and rear of a house to control the tunnel ventilation fans. Similarly, in houses without controllers, thermostats are often placed in the middle of the house so that an average house temperature can be used to control the fans.

Though most of the time an average house temperature can be used successfully to control fans, there are times when it can create serious problems.

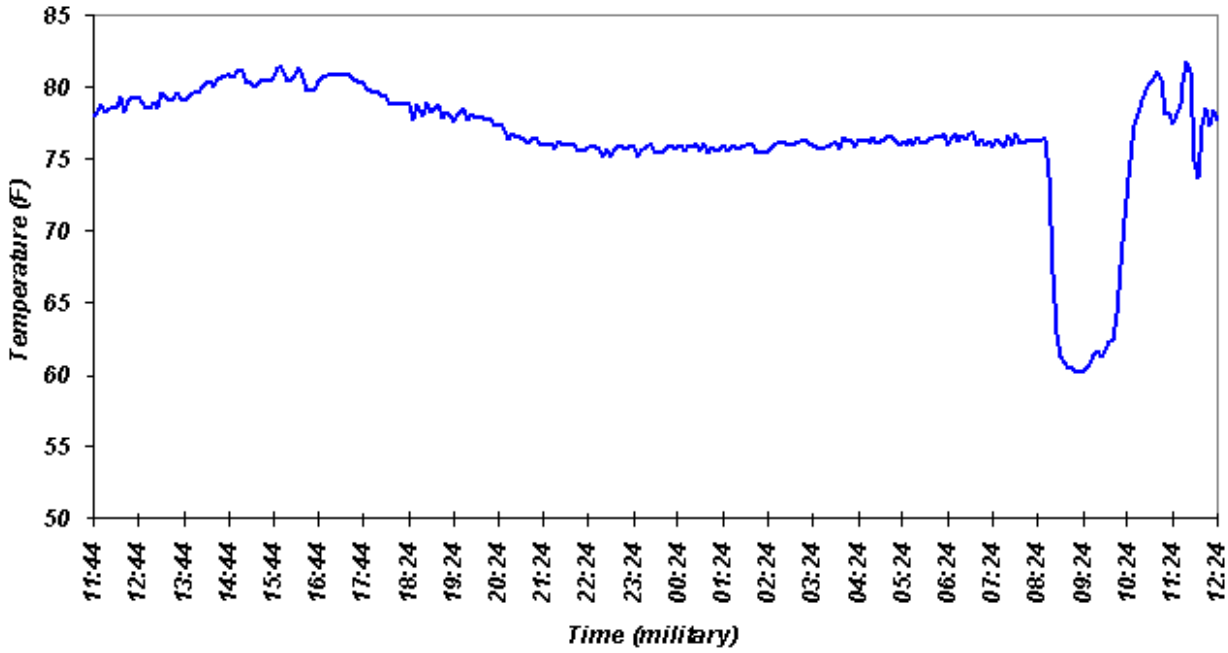

Figure 1. Average House Temperature in a Commercial Layer House on April 1st, 1997

Figure 1 is a graph of the average house temperature of a 90,000 bird, commercial layer house on April 1st of this year. In this 53' X 500' house tunnel-ventilation is used during warm weather and side wall inlets are used during cooler weather. On the date in question the environmental controller was trying to maintain a house temperature of 76° based on the average of ten temperature sensors located throughout the house. Outside temperatures on April 1 ranged from a high of 65° to a low of 38°.

Looking at the graph of average house temperature, it appears that everything was going very well until about seven in the morning when there was a significant dip in house temperature. Figure 2 illustrates individual air temperature at all ten locations during the same time period as shown in Figure 1 and paints quite a different story.

During the day when outside temperature was in the sixties there were enough fans operating that the temperature difference between the inlet and fan end of the house was minimal. But as outside temperature decreased, and the number of fans operating decreased the temperature difference between the inlet and fan end of the house increased. Ideally, after about half the fans shut off the tunnel curtain would have closed and the house would have gone into side wall inlet ventilation, but because of mechanical difficulties, the tunnel curtain did not close all the way and the side wall inlets did not open. By about 11:00 at night the outside temperature had dropped enough that only a couple fans were left operating and a temperature difference of over 30 degrees between the inlet and fan ends of the house resulted. The high air temperature in combination with high relative humidity at the exhaust end of the house proved disastrous and caused the death of approximately 200 birds.

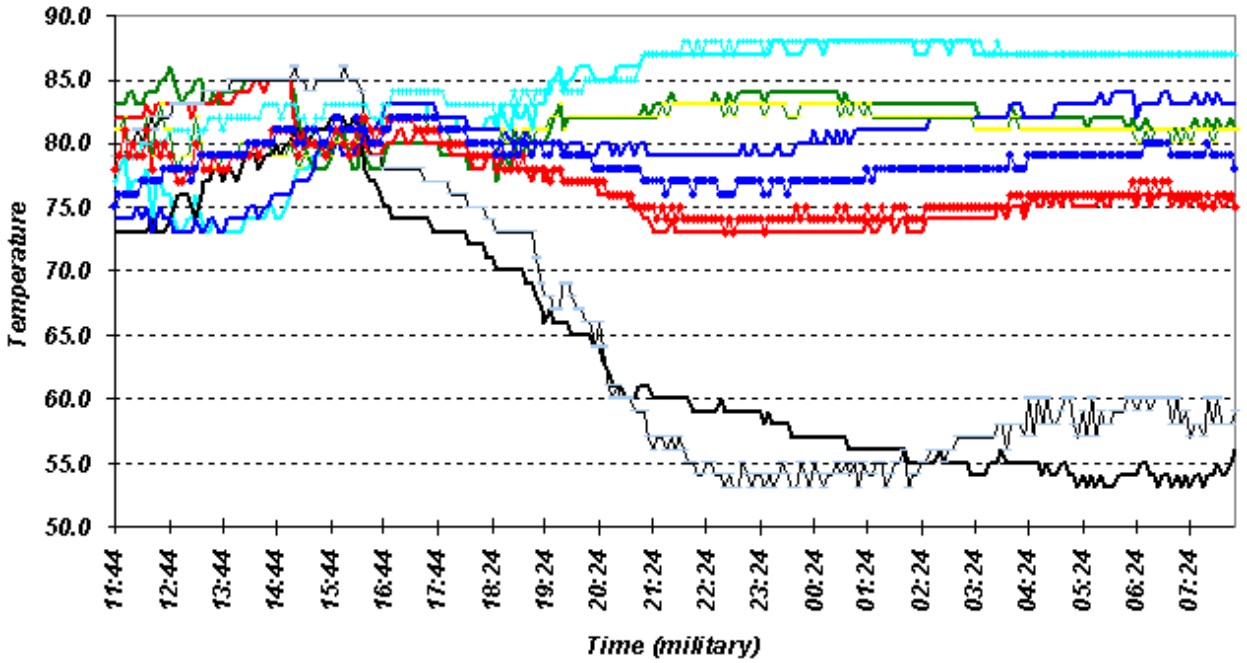

Figure 2. House Temperatures in a Commercial Layer House on April 1st 1997

If you feel safe because you use thermostats and not a controller, you may be mistaken. Many houses which use thermostats place them at half house again to obtain an average house temperature. In Figure 2 the temperature sensors halfway between the fans and the inlet stayed in the mid to high seventies most of the night. Since the set point was about 76°, additional fans would not have come on as the night progressed and the birds would probably still have died.

To minimize the possibility of excessively high temperatures occurring in the exhaust fan end of a tunnel- ventilated house, thermostats should be installed near the tunnel fans (i.e., 3/4 house). If an environmental controller is used, the temperature sensor nearest the tunnel fans should be used when tunnel ventilating. In Figure 2 it can be seen that if the controller in the house in question had used only the sensors nearest the tunnel fans to turn fans on and off, then when the air temperature started to climb into the mid eighties at about six in the evening, additional fans would have come on preventing the build-up of heat in the exhaust fan end of the house.

There is a downside to using air temperature near the tunnel ventilation fans to control fan operation. If a house is left in tunnel ventilation on a cool night, the fan end of the house may be fine but the inlet end can become too cold. Admittedly this is a problem; however, it is better than the tunnel end of the house becoming excessively hot and possibly killing birds.

It is equally important when using an environmental controller that the temperature sensor near the tunnel curtain not be used to control the fans when using tunnel ventilation. In Figure 2 it can be seen that if the sensors nearest the tunnel curtains were used to control the fans, the controller

would have thought the house temperature was about 55° and probably shut off all the fans leading to a major disaster.

Large temperature differences between the inlet and the exhaust fan in a tunnel-ventilated house are most likely to occur during the spring and fall when temperatures can reach into the eighties during the day and fall into the low sixties or high fifties at night. If a producer does not switch from tunnel to side wall inlet ventilation (with either tunnel or side wall fans) in the evening it is possible that enough fans may shut off at night to cause large temperature differences between the two ends of the house. Furthermore, because the air is not being exchanged rapidly there will also be large differences inair quality between the two ends of a house. Near the inlet the air will be cool and fresh, but near the tunnel fans the humidity, ammonia and dust will probably reach unacceptable levels. To be safe, houses should be switched back to side wall inlet ventilation when less than half of the tunnel fans are operating.

In most instances, using average temperatures or thermostats in the center of the house will not kill birds but can result in large differences in air temperature and quality between the two ends of the house from time to time. These can easily lead to performance or health problems if a producer is not mindful.

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