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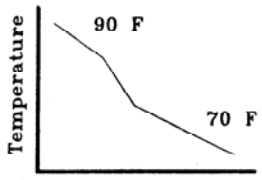

Temperature Reduction in Tunnel-Ventilated Poultry Houses

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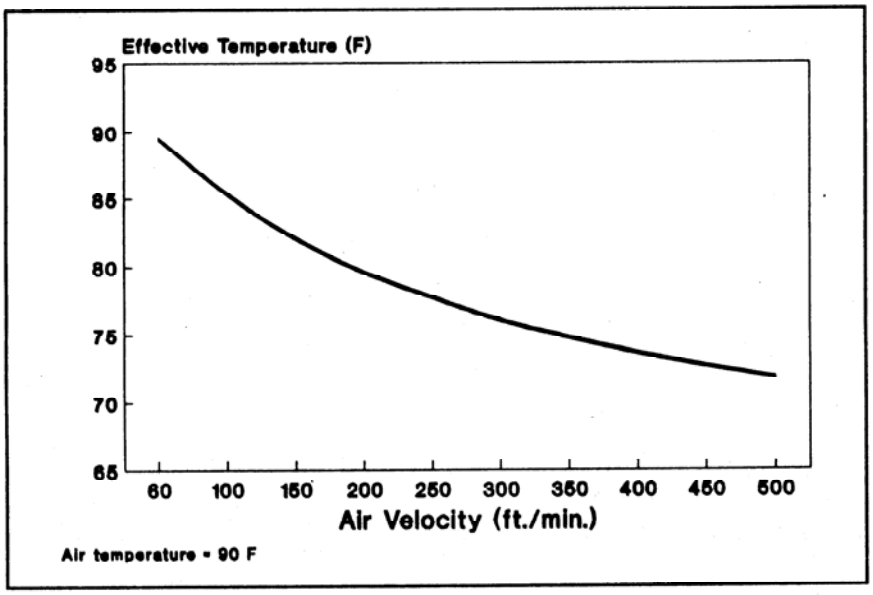
Two of the most important things a grower can do to minimize heat stress during the warm summer months is to provide air movement over the birds and to use evaporative cooling to keep the temperature of the air within the house below 90°F. These two methods of cooling are most effective when used together. Reducing house temperature alone doesn't help much if the cooled air isn't moved over the birds. Likewise, air movement helps only if the temperature of the air is several degrees below that of the birds. The combination of tunnel ventilation and evaporative cooling has proven very effective in reducing summertime heat stress because it provides both maximum air movement and air cooling.

The amount of cooling produced through air movement in a tunnel-ventilated house depends on air temperature, the amount of air movement, and bird age. The colder the air and the faster it is moved over a bird, the greater the cooling effect. The younger the bird, the fewer the feathers, the more easily heat is removed from a bird. The graph below shows the effective air temperature for a fully-feathered bird at different air velocities at an air temperature of 90°F. In a typical tunnel-ventilated house with 350 to 450 ft./min. air movement (measured four to five feet off the floor), the effective air temperature is reduced by approximately 10°F to 15°F. The cooling is slightly less than the graph indicates because air movement at ground level is about 30 percent lower.



PUTTING KNOWLEDGE TO WORK

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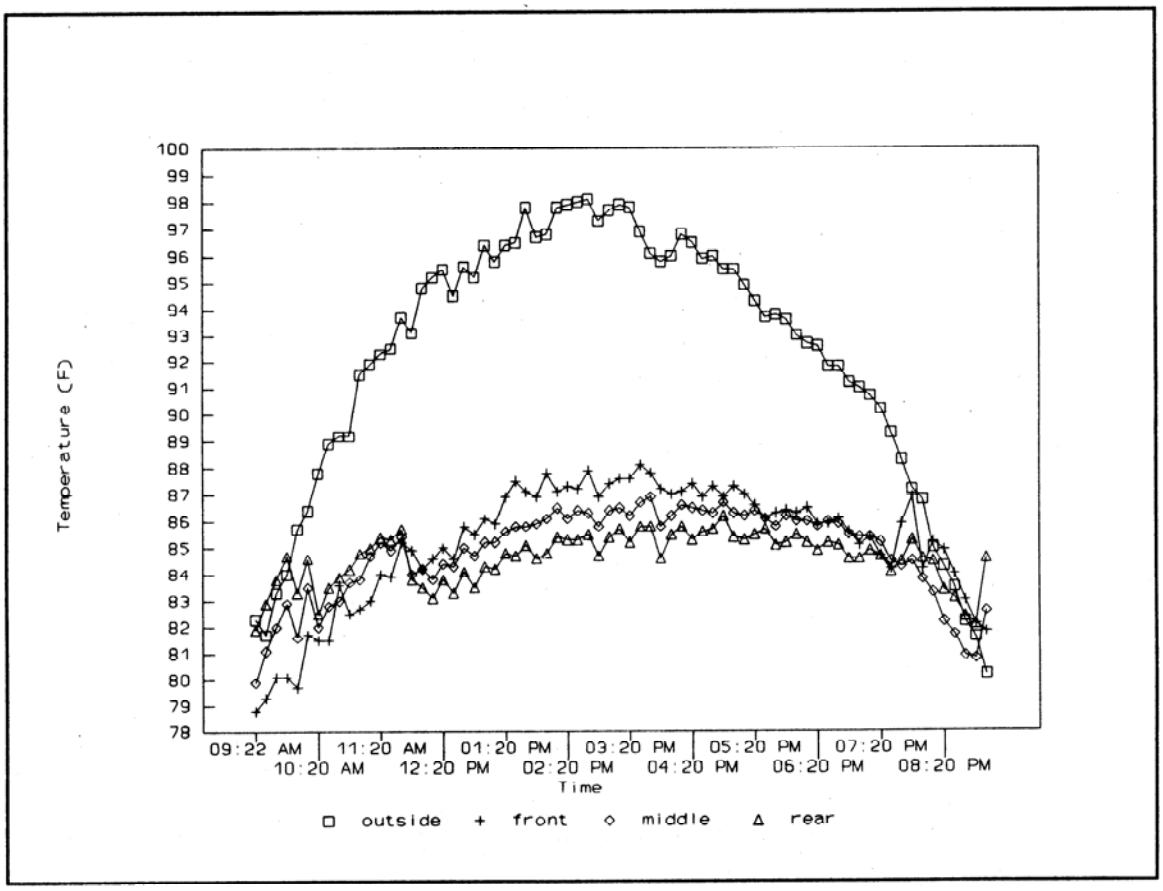
The amount of temperature reduction produced through evaporative cooling depends on the system being used (i.e., pads or fogging nozzles) Studies show that evaporative cooling pads can reduce house temperature as much as 20°F below outside temperature. Traditional fogging systems are less effective in reducing air temperature, producing fewer than ten degrees cooling. The challenge has been to reduce house temperature without causing excess house wetting, since with fogging systems whatever moisture isn't evaporated ends up in the litter, on the equipment, or on the birds.

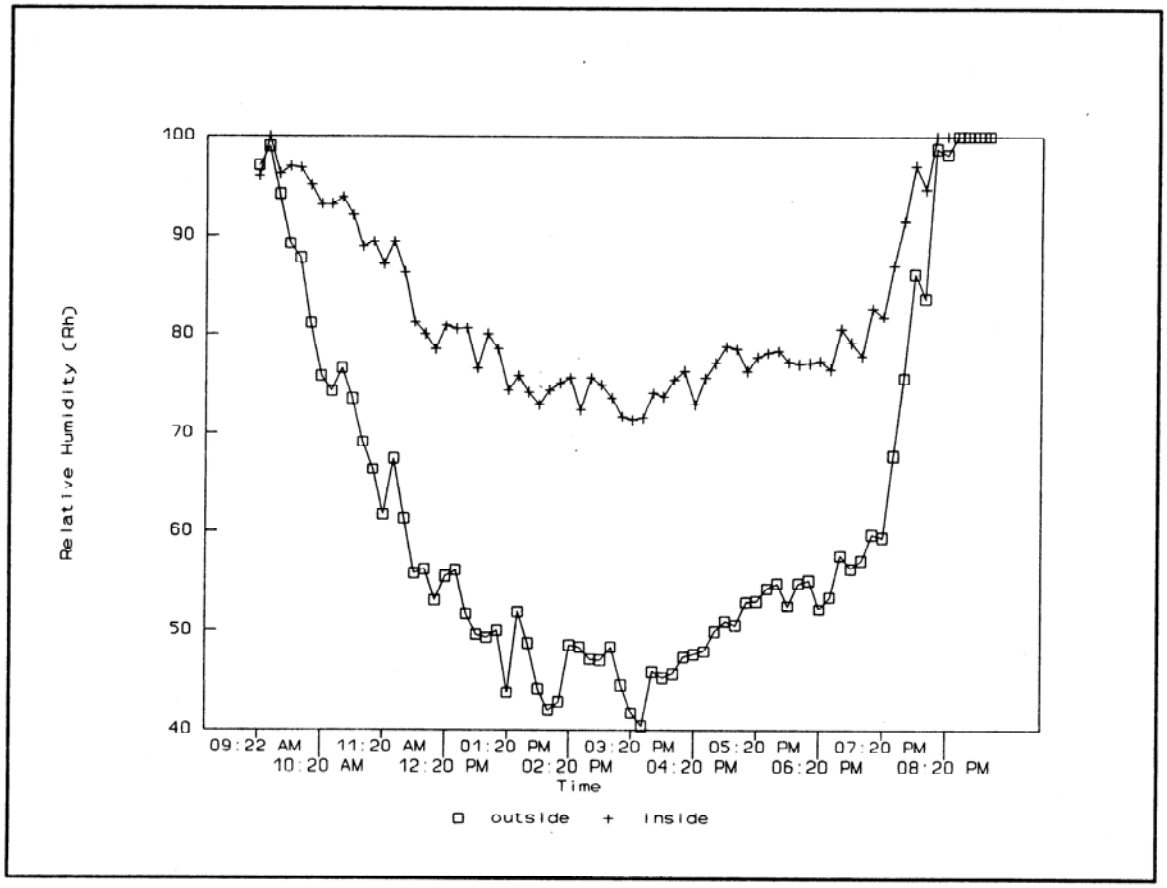
This past summer Extension Engineers and Poultry Scientists have been working with a new fogging system design in the hope of maximizing air cooling without causing excessive house wetting. The fogging system consisted of 140, 1 gal./hr. stainless steel nozzles operating at 220 psi. The nozzles were installed so they could be turned on in two stages, half of the nozzles coming on at 82°F and the other half at 85°F (see Designing Fogging Systems for Tunnel Ventilated Houses, June 1992). In addition, the system was controlled by a electronic humidity controller that would not allow the fogging system to run if house humidity exceeded 80%.

The system was installed in two 40' X 400' curtain-sided houses, each equipped with seven 48" fans. One house had an electronic humidity controller, the other system was controlled using two thermostats and a 24-hour time clock. 17,900 birds were placed in each house on May 21st and grown to 56 days of age.



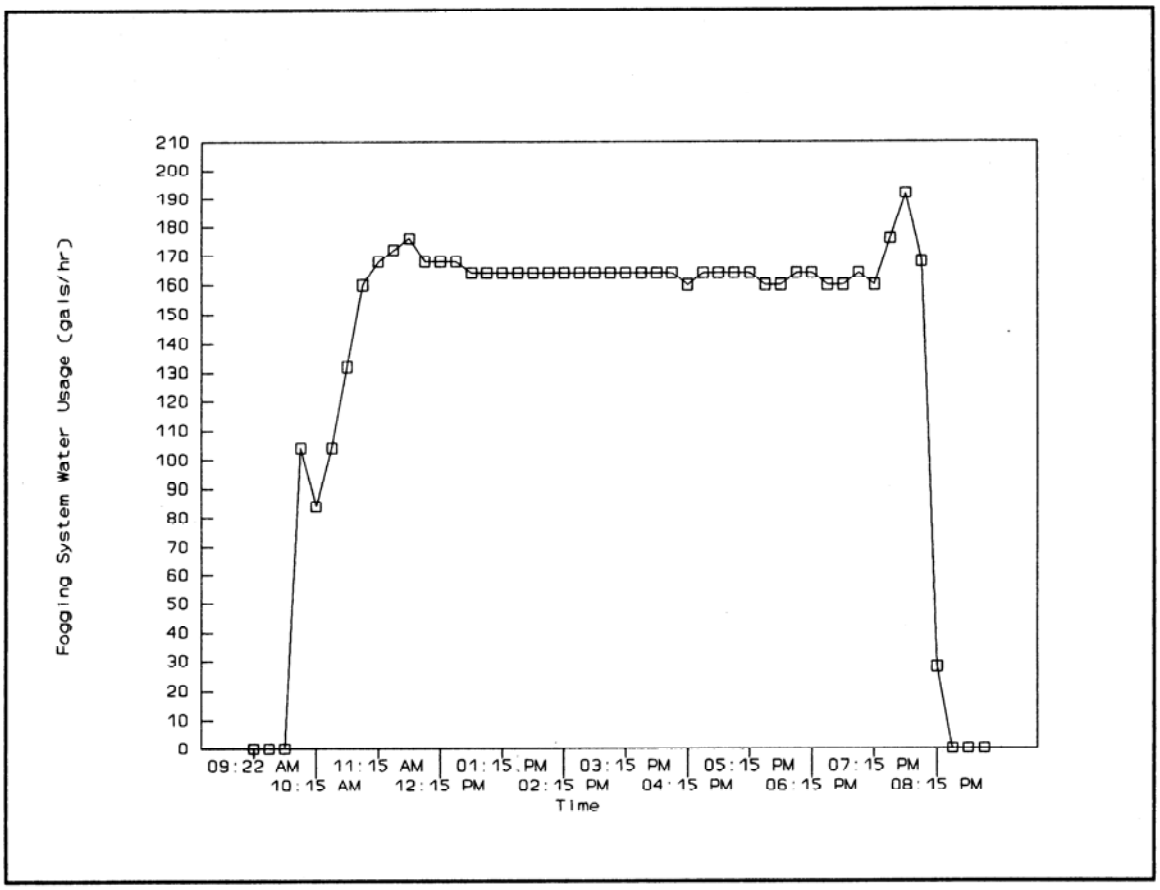
During the second week in July, the birds in the test houses were seven weeks of age. Outside temperatures during this week ranged from the mid 70's at night to the high 90's during the day. On the hottest day, outside temperature reached 98°F with a relative humidity of 45%. During the warmest portion of this day the two-stage fogging system reduced house temperature an average of 11.5°F.

The amount of cooling produced by the system varied with location in the house. In the front of the house (60' from the end wall), only 9.5°F of cooling was produced, whereas in the rear of the house (near the fans), 13.2°F was produced. House relative humidity was in the mid 70's throughout most of the day.



When all the fogging nozzles were running, the system used 165 gals./hr. of water. Each nozzle put out approximately 1.2 gals./hr. of water due to the increased water pressure. During the seventh week, the system used as much as 1,700 gallons per day.

With the humidity controller, litter in the house was dryer and the bird's feathers appeared slightly cleaner than those in the house using thermostats. One of the most significant differences observed was in the amount of dust that collected on fan shutters. Fans in the house with thermostats required cleaning about three times as often as those in the house with the humidity controller. These observations suggest that the controller successfully prevented the foggers from operating at times when high humidity would not allow adequate fog evaporation.



The fogging system in both houses did provide greater than 10°F cooling without excessive house wetting. It was observed during the warmest days that more nozzles probably could have been used without causing any significant house wetting. It appears that in the future fogging systems could incorporate as many as 30, 1 gal./hr. nozzles per fan installed in multiple stage configuration.

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