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A CASE STUDY OF TEMPERATURE UNIFORMITY IN LAYING HEN PRODUCTION BUILDINGS

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Even when the average temperature in a livestock production house is "on target," regions within the building may be far above or below desired temperature.

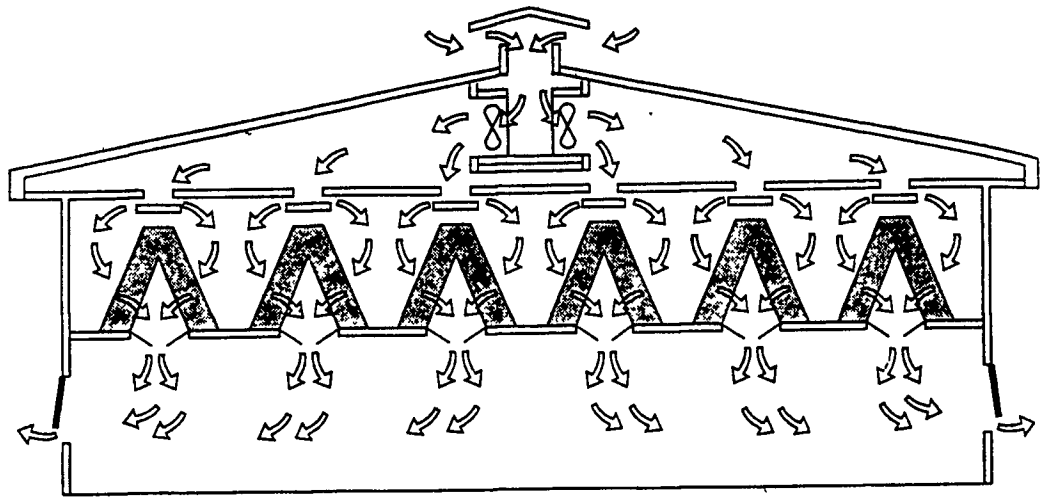

Figure 1. Transverse cross-section of TurboPositive™ house.

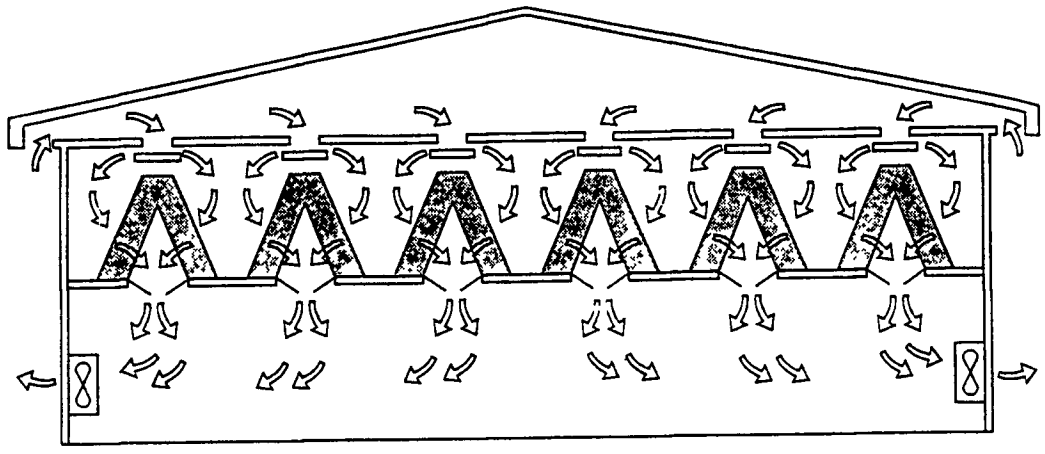

Figure 2. Transverse cross-section of Turbo Negative™ house

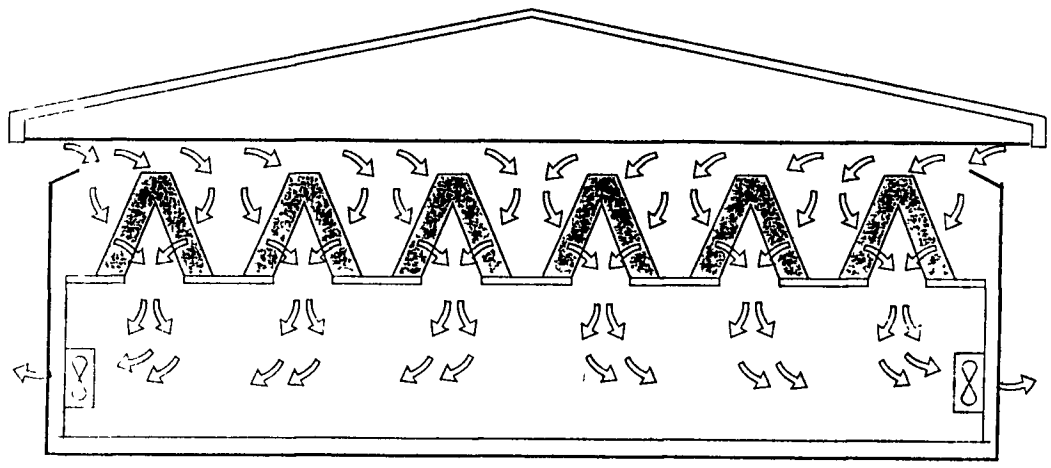

Figure 3 Transverse cross-section of perimeter baffle house.

Research at Penn State investigates why temperature and other air quality factors are not uniform within laying hen production houses.

Depending on the building design and the environmental control system, air flow, airborne particles, and temperature that one group of birds experiences can be greatly different than that experienced by birds in a different region of the house.

Environmental conditions affect production, feed intake, behavior, and health. Nonuniformity of environmental conditions prevents the entire flock from producing to its genetic potential and therefore reduces the farm's profit potential.

In an effort to understand more about temperature uniformity in laying hen production buildings, a case study was conducted. The production buildings on the same farm complex with similar bird densities, bird ages, and environmental control management were monitored hourly from May 199 until February 1994. Each house contained 48 temperature sensors.

The Turbo Positive™ house (Figure 1) is a positive pressure system with slotted ceiling inlets and fans in the attic space, and is 21 meters x 206 meters (70 feet x 675 feet). The Turbo Negative™ house (Figure 2) is a negative pressure system with slotted ceiling inlets and fans in the pit, and is also 21 meters x 206 meters (70 feet x 675 feet). The perimeter baffle house (Figure 3) is a negative pressure system with perimeter baffles and fans located in the pit, and is 17 meters x 146 meters (56 feet x 480 feet).

Ventilation rates are basically dependent upon target inside temperature, bird density, and outside air temperature. In the case study, 11 outside temperature ranges were investigated from less than -10 C. (14 F.) to greater than 35 C. (95 F.). Temperature ranges were in increments of 5 C. between -10 C. and 35 C. (-10 to -5, -5 to 0, . . . 30 to 35). The standard deviation of temperature within the building for each outside temperature range was calculated.

During cold weather, the greatest stratification of temperature occurs in buildings because less ventilation is needed. This is evident in Figure 4 which shows the standard deviation of temperature in each building for each outside temperature range.

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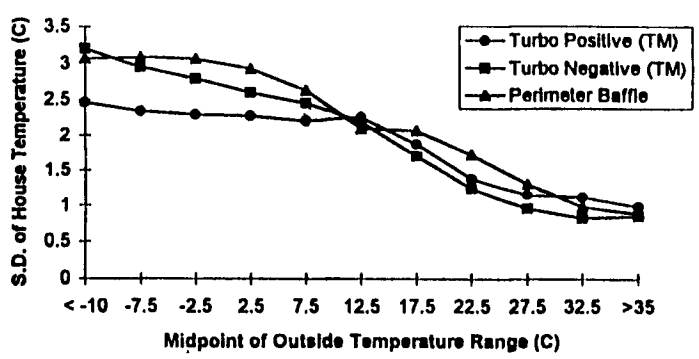

Figure 4. Standard deviation of temperature in three houses during eleven outside temperature ranges.