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MANAGING BROILERS DURING HOT WEATHER

W. D. Weaver
Professor And Head, Dept. Of Poultry Science

Pennsylvania has certainly experienced a severe winter, punctuated with low temperatures and a large accumulation of snow, all of which can place extreme stress on all species of poultry.

With the winter of 1993 and its many days of snow and bad weather still imprinted on our minds, poultry farmers may have difficulty focusing on hot weather and the stresses, and in some cases, death, that can occur under these conditions.

But we all realize that winter is followed by spring and then summer, and in many instances the stresses imposed by summer heat can be even more devastating than the cold conditions of winter.

Genetically, broilers are selected to grow rapidly and to convert feed to meat at a high level of efficiency. To accomplish this feat, broilers have had to give up a number of fitness traits which allow them to survive under somewhat extreme conditions.

The ability to withstand heat is such a trait. For example, producers continue to upgrade their facilities to assist birds in coping with hot weather. First, fans were used to remove hot air and to create air circulation. Then, approximately 10 years ago, evaporative cooling systems (both foggers and pads) were introduced to further assist with keeping birds comfortable.

Most recently a management practice known as tunnel ventilation has been installed in a number of Pennsylvania broiler houses to further aid in the reduction of the stresses associated with summer heat.

Before proceeding with a discussion on the operation of the various ventilation and evaporative cooling systems, let us address the mechanisms birds have at their disposal for regulating body temperature. In addition to two lungs, birds have nine separate air sacs located in the body cavity that aid in reducing body temperature. By increasing the rates of respiration (panting), the bird is able to increase the rate of airflow through the air sacs and accelerate cooling by evaporation (heat required to convert water to a vapor) and convection (heat removed by passing cool air across a warm surface). Birds also cool themselves by dusting in the litter which allows heat to be transferred from their body to the litter (heat transferred from a warmer to a cooler object by contact is known as conduction). Birds will also hold their wings away from their bodies, which allows greater amounts of cooler ambient air to pass over a larger portion of the body surface (another example of convection).

The orientation and general design of the poultry house can impact on how cool it will remain during warmer months. The long axis of houses with curtain sidewalls should run east and west. When adequate roof overhang is provided, this arrangement will not allow the sun to directly shine into the house during the warmer months, because during this time of year the sun traverses a higher arc in the sky. Further, during the colder months when the sun remains closer to the horizon, it will many times shine into the house and produce some solar warming.

Adequate roof insulation is also important to reduce the heat that can be gained through radiation heat transferred from a warmer (roof) to a cooler (bird) surface. Fibrous (fiberglass, cellulose, etc.) and rigid board (polystyrene, polyurethane, etc.) materials are generally used for insulation in broiler houses and should be installed at a rate that will provide a minimum of R=20 in the ceiling and R=14 in the sidewalls.

"Tunnel ventilation" is a new management concept which has been introduced during the last several years to further aid producers in coping with high summer temperatures. The system places all of the exhaust fans in one end of the building and the air inlets in the other, and when operating, creates a constant stream of air down through the house. Tunnel systems are normally designed to create an air jet which travels at approximately 400 feet/minute from the inlet to the far end of the house (another example of convective heat loss).

The best way to conceptualize the system is to view the cross section of the house as one large air inlet, for example, a house which is 44 feet wide and has a 10 foot high ceiling would have a cross section area of 440 square feet. The calculation required to determine the needed fan capacity is simply 440 square feet x 400 feet/minute (speed of the air jet) = 176,000 cubic feet/minute or CFM.

Tunnel ventilation in general operates in conjunction with foggers installed in bands approximately 50 feet apart across the house. Fogger nozzles should be a hollow cone design and emit a wide angle mist (approximately 100 degrees), and when operated at a minimum pressure of 200 psi (pounds per square inch), provide approximately two gallons of water per nozzle per hour (2 GPH). Further, the combined capacity of all nozzles should provide nine gallons of mist (water) per hour per 1,000 square feet of floor space.

As geneticists continue to select broilers to grow more rapidly and the market place continues to require larger birds, integrators and producers will be continually challenged to upgrade their management practices to cope with hot weather conditions. First, producers must understand the bird's natural mechanisms for cooling itself, then be willing to assist these mechanisms with mechanical systems to maximize performance. Tunnel ventilation supported with foggers is the system of choice today for accomplishing this feat.