The *Poultry Engineering, Economics & Management*
NEWSLETTER

Critical Information for Improved Bird Performance Through Better House and Ventilation System Design, Operation and Management

Auburn University, in cooperation with the U.S. Poultry & Egg and Alabama Poultry & Egg Associations
Issue No 48, July 2007

Keeping Birds Cool, Costs Down in Summertime Heat

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Across the U.S. Broiler Belt, almost all producers now rely on tunnel ventilation and some form of evaporative cooling to keep birds growing in hot weather. Investment in the needed equipment usually pays off because the cooling results in lower mortalities, better feed efficiency, and more live weight at catch time. With the costs of both electricity and water rising, keeping your bottom line from sagging requires that you keep cooling systems working at top efficiency and with no waste of either water or electric power. This newsletter focuses on the most important things every modern grower should be doing in hot weather, especially with regard to evaporative cooling, your last and best defense against over-heating birds.

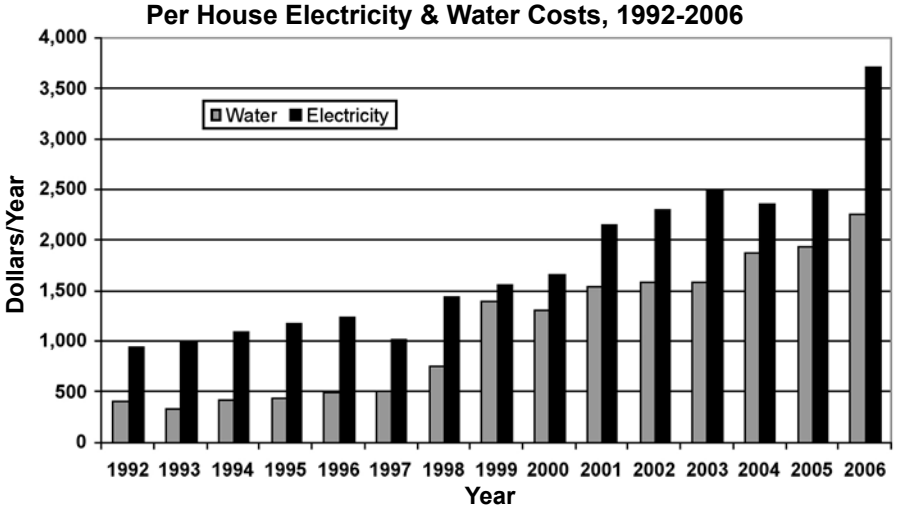
Air Flow & Wind Speed – Key to Cooling

Having enough air moving at high enough velocity – for most modern houses, 500-600 feet per minute – is absolutely essential for keeping birds cool in hot weather. You must have the 10-12 degrees of tunnel ventilation wind-chill cooling to serve as the base on which evaporative cooling can add its real cooling – lowering actual air temperatures as much as 12-15 degrees, so the birds will be experiencing a temperature in the low 70s when actual outside air temperature is in the 90s.To get all the tunnel ventilation wind-chill cooling you're paying for in electric power, there are three basic requirements:

1. The house must be tight. All incoming air must come in through the tunnel inlets, not through cracks or other openings. A tight house will pull a static pressure of at least 0.15 inches running one 48-inch fan with all doors and air inlets closed. If your house can't pass this test, you won't get effective cooling.
2. Fan belts must be tight and not worn down so they ride low in the pulleys. See photos on page 2. A worn belt, even if tight, will use the same amount of power as a good belt but will not turn the fan at its rated air-moving capacity. Just a 10% loss of fan rpm's can cost you 3 degrees of wind-chill cooling.

Keeping birds cool costs more money these days, giving growers more reasons to keep cooling systems operating at top efficiency. Costs for both electric power and water have been increasing rapidly over the last fifteen years. Numbers shown here are from north Alabama, but reports indicate the trends shown here are fairly typical across the U.S. Broiler Belt. Even growers getting water from on-farm sources are in effect paying more for the water through increased pumping costs.

Per House Electricity & Water Costs, 1992-2006



Keeping tunnel windspeed up to design specification is absolutely essential to getting all of the wind-chill and evaporative cooling you are paying for. If fan belts are worn or dust allowed to built up on fan blades, electric costs stay high but cooling will be severely reduced.

3. Fan blades and shutters must be clean. Dust and feathers accumulating on a fan blade change the aerodynamics of the blade. Studies in the field have shown that dirty fan blades and shutters can reduce airflow by as much as 30%. It takes as much electric power to run a dirty fan system as a clean one, but you won't get anywhere near as much wind-chill cooling.

Water – Vital For Real Cooling

An adequate supply of good-quality water is the second essential requirement for hot-weather cooling. A high-efficiency six-inch recirculating pad system can give as much as 12-15 degrees of actual temperature drop. Many of our poultry farms now buy utility water, which is becoming more pricey but usually is of good quality, so growers can avoid some of the costs often involved in using on-farm water sources, including pumping, filtering out sediment or rock particles and purchasing and operating water purification systems. However it is done, providing clear, good-quality water for both drinkers and evaporative cooling systems is a must. Growers must also make sure the quantity of water available is adequate. A four-house broiler farm may consume as much as 50-60 gallons per minute. The May 2007 issue of "Poultry Tips" on the University of Georgia poultry ventilation website www.poultryventilation.com offers a handy fact sheet on broiler farm water use.

Keeping water costs under control involves making sure water is being used most efficiently – covered below in the sections on evaporative cooling maintenance and operation – and monitoring to make sure it is not being wasted through leaks in drinker lines or cooling systems. Many modern controllers are designed to accommodate various water-flow metering sensors in drinker lines and cooling systems. Seeing a daily printout of water usage in different systems is a quick way to spot unusual water use that may signal a leak.

Evaporative Cooling Systems – Regular Maintenance Pays Off

Given the costs of the water and the electric power being consumed, it makes sense to keep up with the maintenance steps needed to keep cooling systems operating at top efficiency. Daily monitoring to make sure all pads are being thoroughly wetted is the first step. Any dry streak on a pad is a place where hot air is rushing into the house. Pumps, sumps and filters should be checked regularly and cleaned as frequently as needed to prevent algae and sludge or sediment clogging that causes reduced water pressure across the dis-

Proper maintenance of evaporative cooling systems, including filter cleaning and changing, will impose a certain amount of cost on a grower. Failure to keep systems operating as designed, however, carries a far greater cost. Runnng an evaporative cooling system without a filter invites disaster. Even if water quality is good to start with, any minerals or particles in the water, plus any dust or trash that inevitably gets into the trough, will be more and more concentrated in the system water as more and more water is evaporated off of the pad, and the buildup of sludge will quickly and severely clog the pads. Allowing filters to get clogged (below left), on the other hand, restricts water flow, which will severely reduce cooling. Keep filters installed and check and clean or replace them weekly unless experience shows this can be done at longer (or should be done at shorter) intervals.

Recirculating pad cooling systems save on water costs by re-using water. However, to maintain efficient cooling, system water should be dumped and replenished as needed, usually on a weekly basis. Dirty water, as seen in sump at left, leaves all its dirt on the pad as the water evaporates, reducing the system cooling. Photo at right shows clear water in a well-maintained system.

Clogged holes in distribution headers can often be cleared by poking a small screwdriver or other tool into the hole to remove the foreign matter.

Clogged pads or headers result in dry areas on pad. Hot air coming in through dry areas causes severely reduced cooling and increased electrical costs.

Grass clippings, leaves, dirt, and other materials must not be allowed to collect on evaporative cooling pads. Buildup like this severely reduces cooling by restricting airflow through the pad. Even worse, it will stop up a filter in a matter of seconds if allowed to enter the system water storage. It pays to keep areas around houses clean and free of trash, and never to allow grass clippings or even dust to be blown toward pads.

A soft bristled brush similar to the ones used to clean automobiles can be used – carefully – to clean pads without damaging them.

Using a low pressure water source and a spray nozzle can effectively dislodge plugs of buildup in the pads that a brush cannot reach.

tribution header and poor, non-uniform pad wetting. Many growers consider filters a nuisance; but be assured that operating without a filter will soon cause even worse problems. Pads also must be checked frequently and cleaned as needed. A clogged pad severely restricts airflow, hurting both evaporative and wind-chill cooling. Photos on pages 2 and 3 show the most important points to pay attention to. To maintain water quality in recirculating systems, most manufacturers recommend bleeding off water in the system or replacing the water at least once a week during heavy usage.

Evaporative Cooling – Operating For Top Efficiency

To save on operating costs, some growers are tempted to delay turning on tunnel ventilation and evaporative cooling. This practice risks losing more in flock performance than is saved in electric and water costs. With fully feathered birds, and especially with larger birds, tunnel should be turned on as soon as power ventilation is inadequate to keep in-house temperature from rising. Evaporative cooling, again especially with larger birds, should be turned on when in-house temperature gets to the 80°-84°F range, and not be forced to play catch-up when in-house temperatures are already too high.

During the day, cooling systems are best operated so that pads stay continuously wet. It is uneconomical and has little cooling effect to run evaporative cooling at night. In most locations evaporative cooling should be turned off by 9 or 10 pm and the pads allowed to dry out during the night. However, it is usually beneficial, especially with larger birds, to run tunnel fans through the night; this removes built up heat in the birds' bodies and gives the birds a head start the next morning.

Migration fences are essential to maintain uniformity in the house, keeping birds from crowding into the cooler inlet end. Especially in longer modern houses, it may be helpful to install a few "rainbow" fogging lines toward the fan end of the house, to re-cool tunnel air that has picked up heat from the birds. The house end-to-end temperature difference should be monitored. Ideally, we should be able to keep this differential under 5 degrees F; if it approaches 10 degrees or more, it signals a problem to be investigated.

The Bottom Line

Rising water and electric power costs are certainly a threat to every broiler producer's bottom line. The best response can only be to pay closer attention to proper maintenance and operation of cooling systems. That is, make sure you have no wasted water or power and your cooling system is delivering all the possible benefits you are paying for.

U.S. Poultry & Egg ASSOCIATION

This newsletter is produced in cooperation with the U.S. Poultry & Egg and Alabama Poultry & Egg Associations, as part of their commitment to poultry industry education. We appreciate their support and are proud of our relationships with these organizations.

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ALABAMA COOPERATIVE Extension SYSTEM

The Poultry Engineering, Economics and Management Newsletter provides up-to-date information on topics of interest to poultry production personnel, focusing on most effective and efficient uses of modern technology and equipment, with a special emphasis on economic implications. The Newsletter is published six times a year, or as needed to address emerging or special issues. Contact: Jim Donald, Extension Biosystems Engineering, 228 Corley Bldg., Auburn University, AL 36849-5626, (334) 844-4181, fax (334) 844-3548, jimdonald@aces.edu. Published by:

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