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Poultry Housing Tips

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Using Cold Water in Evaporative Cooling Systems

Though air movement is a grower's most effective tool in combatting heat stress, his evaporative cooling system (i.e.,fogging, fogging-pad, or pad system) is a close second. Studies have shown that as air temperature climbs above 85°F, the "wind chill" effect produced by air movement decreases. This is not to say that circulation fans and tunnel ventilation are not effective at reducing heat stress when it gets hot, but rather, in order for air movement to have a maximum cooling effect, house temperature should be kept below 90°F. By far the most inexpensive method of reducing air temperature is through evaporative cooling.

An evaporative cooling system works off the simple principle that as water evaporates into the air heat is removed from the air, thereby lowering its temperature. The more water you can evaporate into the air the more cooling produced. This of course is why humidity has such an effect upon the amount of cooling produced by a fogging or pad system. The higher the humidity, the lower the amount of water which can be evaporated into the air and less cooling produced.

One of the most confusing aspects of evaporative cooling is that water temperature has virtually no effect on the amount of cooling produced by an evaporative cooling system. You can put hot or cold water in an evaporative cooling system and the amount of cooling produced by the system will not change significantly. As a result, growers should not concern themselves with cooling the water going into their evaporative cooling system.

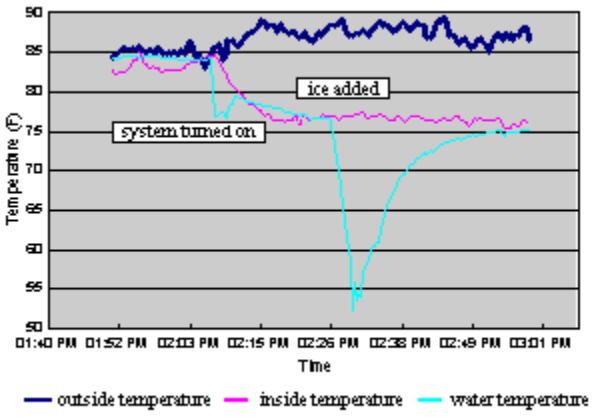

Figure 1. The Effect of Water Temperature on Evaporative Cooling

To verify this fact we recently placed thirty, five-pound bags of ice into the water tank of an evaporative cooling pad system. Outside, inside and water temperature were recorded every 10 seconds starting a few minutes before the system was turned on, continuing through the addition of the ice, and ending after water temperature returned to normal.

As can be seen in Figure 1, the addition of ice to the water tank did not have any significant effect upon the temperature of the air entering the house. Whether the water was 77°F or 52°F, the temperature of the air entering the house remained about 77°F. If more ice were to be added, the water temperature would drop further, but house air temperature still would be relatively unaffected.

Why? When you evaporate a gallon of water into the air approximately 8,700 BTU's of heat are removed from the air. But, it only takes approximately 8 BTU's of heat to increase the temperature of one gallon of water 1 degree F. So if the water is 20 degrees cooler, an additional 167 BTU's of heat will be removed from the air, a two percent increase. This is because it takes a lot more energy to evaporate water than it does to heat it 20 degrees.

What would colder water mean to the cooling produced in the average house? A good evaporative cooling system will produce a minimum of ten degrees of cooling through the use of fogging nozzles or pads. In order to produce ten degrees of cooling approximately 200 gallons of water has to be evaporated each hour. The evaporation of 200 gallons will remove 1.74 million BTU's of heat from the air. By using 20 degree colder water only an additional 35,000 BTU's of heat will be removed, resulting in an additional 0.2 degrees of cooling. It just doesn't really matter what the temperature of the water is in an evaporative cooling system.

You can see this phenomenon for yourself by placing one arm in a bucket of cold water and the other in a bucket of warm water. When your arms are in the water you can feel the difference in temperature. But, if you were to place your wet arms in front of a fan, after a few seconds they would both feel equally as cool.

If you are trying to get more cooling out of your evaporative cooling system, the answer is not adding chilled water to your system, but proper operation and maintenance. On pad systems make sure the entire pad is thoroughly wetted. On fogging systems, make sure that the nozzles are putting out a fine spray and your pump is providing adequate pressure.

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