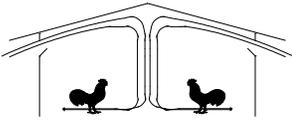




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Poultry Housing Tips

The Importance of Flushing Evaporative Cooling Systems

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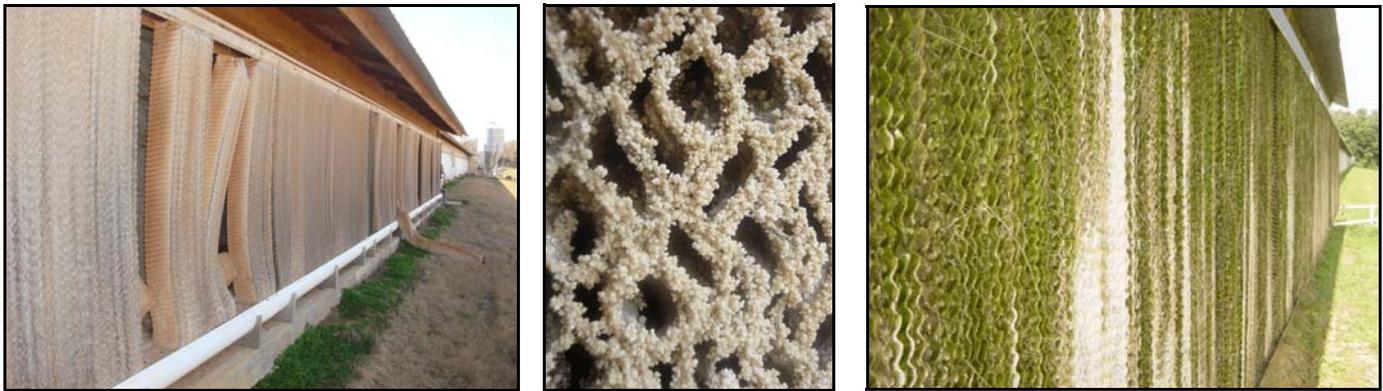


Figure 1. Pad damage as the result of poor water quality.

One of the best ways of insuring maximum pad life as well as bird cooling is to simply flush your evaporative cooling system on a regular basis. Tens of thousands of gallons of water can evaporate from a poultry house's evaporative cooling system each week during hot weather. A potential problem lies in the fact that only pure water evaporates from the evaporative cooling pads. Any minerals and/or contaminants in the water do not. Over time as these contaminants concentrate in the water, they can become corrosive and turn the pads to mush, or settle out on the pads and turn them into rock (Figure 1).

The typical six inch evaporative cooling pad system (50' to 70' long) holds between 100 and 150 gallons of water. Over the course of the day between 500 and 1,500 gallons of water can evaporate from each of a house's two pad systems. This means that each day the concentration of any minerals or contaminants in the water can increase five to ten fold. Over the course of a month the concentration of minerals or contaminants can increase well over 100 fold! So, a producer can have good water with a relatively low mineral content but by the end of a flock be circulating a highly concentrated mineral solution over their pads. If the evaporative cooling system's make-up water is of poor quality, minerals can build up to harmful levels in relatively short order. The higher the concentration of minerals that are in the water circulating over the pads the more likely they will precipitate on the surface of the pad restricting the flow of air into a house resulting in hotter birds and higher electricity bills.

In some poultry growing areas water with a high pH is a problem not only for the birds but the pads as well. The pH of the water should be between 6 (slightly acidic) and 8 (slightly caustic). High pH (alkalinity) is associated with bicarbonates, carbonates, sulfates or hydroxides that are found at various levels in many sources of well water. When water evaporates from the cool cells, these components can become concentrated in the recirculation system resulting in a pH increase. Without flushing the tank, the pH of the water will become caustic enough to destroy the cellulose in the pads or the resins which

provide rigidity to the evaporative cooling pads. The paper may start to look fluffy like cotton or there may be no firmness to the pads causing them to slump out of the frames (Figure 2). It will be worse in areas of the pads that dry out first.

Other contaminants which are often linked to alkalinity is calcium and magnesium. These minerals tend to settle out onto evaporative cooling pads, basically turning them into rock and clogging the airways. One option for reducing hardness is a water softener which removes these minerals and replaces them with sodium in the water. Another option would be to add an acid to the water to lower the pH. By lowering the pH to 7 or slightly lower, this increases the solubility of calcium and neutralizes bicarbonates, resulting in less “scale” deposits on the pads. You will need to make sure that the pH does not go much below 7 or you can harm the pad. Keep in mind that adding acid also adds nutrients to the water which can promote algae growth. Therefore it is important to have a good water sanitation program that provides a chlorine residual of 3 to 5 ppm in the fresh water supply. This does not mean that you should pour bleach (chlorine) directly into a recirculation tank. The resulting momentary high concentration of chlorine will dramatically reduce pad life.

The correct water treatment option can vary significantly from farm to farm and as a result it is very important to consult a independent water quality specialist before purchasing/installing any water treatment system. Once you have a recommendation, you should check with your evaporative cooling pad manufacturer to make sure that the prescribed treatment will not adversely affect pad life.

For water that has been softened or had chemicals added to it, there is still the same amount of dissolved solids in the water. This water cannot be evaporated indefinitely. You will still need to dump the recirculation tank from time to time. Remember each time the pump shuts off, everything in the water will tend to be deposited on the pads. The cleaner the water, the cleaner the pads.

Other naturally occurring components in water that can concentrate over time in recirculation systems are sodium, chloride and iron. Salt is naturally corrosive and when levels increase drastically, damage can occur. Iron becomes a problem when it creates a food supply for iron loving bacteria and the resulting thick biofilm (slime) can literally clog cool cells. A good water sanitation program can help prevent this which is not only beneficial to the pads but to the birds as well.

Source	Iron (ppm)	Copper (ppm)	Calcium (ppm)	Sulfates (ppm)	Sodium (ppm)	Chloride (ppm)	pH
Well	0.05	0.01	28	5	46	228	8.63
Recirculation Tank	0.29	0.07	7.5	439	126	2,302	9.88

Table 1. Water quality analysis from farm with evaporative cooling pad damage.



Figure 2. Pad damage due to high pH water.



Figure 3. Build up of calcium sulfate (gypsum) on pad surfaces.

Table 1 are water samples taken from the well and recirculation tank from a farm in Texas and provides an example of how naturally occurring minerals in water can build up in an evaporative cooling pad system. Needless to say, this producer experienced extensive cool cell pad damage (Figure 2).

Table 2 is a water sample taken from a farm in Georgia which had a problem with hard water. The circulation of hard water over the pads resulted in a significant build up of calcium sulfate on the surface of the houses' evaporative cooling pads which reduced the air moving capacity of the house's tunnel fans (Figure 3).

Source	Iron (ppm)	Copper (ppm)	Calcium (ppm)	Sulfates (ppm)	Sodium (ppm)	Total Hardness (ppm)	Ph
Well	0.03	0.01	194	440	18	500	7.3

Table 2. Water quality analysis from farm with pad damage due to mineral build up.

Of course the best solution to the above problems would be to properly treat the water coming from the well. This would not only benefit the birds but would significantly increase pad life as well. But, often water treatment can be a very expensive option. Simply flushing the recirculation system from time to time can help to minimize the problem until a proper water treatment option can be employed. In some cases a water treatment system may only partially treat the water thus increasing the need for flushing an evaporative cooling system from time to time.

Even if you have good water quality flushing your system from time to time is still important. Over the course of a month millions of cubic feet of air will move through a house's pad systems. The wetted pads can act like air filters cleaning the air as it enters the house. The problem is that anything that is cleaned from the air (dust, biological material) ends up in the evaporative cooling system water. As these materials build up over time we can end up essentially circulating "pond water" over the pads resulting in a build up of algae on the pads. Though there are chemicals that can be added to a pad system to help control algae, the fact of the matter is that if a system is flushed on a regular basis there would be no "food" for the algae to feed on.



Figure 4. Electric dump valve.

How often an evaporative system should be emptied depends on the quality of the water on a farm. If you have average water quality a pad system should ideally be dumped a couple of times a week when the weather is hot and the pads are running long hours. During milder times of the year or if you have very good water quality once every other week will typically prove sufficient. On the surface this may seem like you would be wasting a lot of water. But on a broiler farm you may only end up flushing a system a half a dozen times a flock or less. Considering the fact that the typical pad system may use between 10,000 to 40,000 gallons a flock, the 300 gallons lost when flushing a system will be barely noticeable. Even on a breeder farm where a producer may need to dump the systems a few times a month for the entire summer it is still not a lot of water when you consider the birds alone are typically drinking over 30,000 gallons a month.



Figure 5. Electric dump valve in operation.

If you have poor water quality (high mineral content, high pH) it may be necessary to empty the distribution systems on a much more frequent basis (possibly daily). In these cases you may want to consider automating the flushing process. There are commercially available low pressure, high volume, electrically operated valves (www.ellisonandellison.com) that can empty the typical evaporative cooling system in 15 minutes or less (Figures 4 and 5). The valves are relatively inexpensive (approximately \$100) and can be wired into a simple seven-day time clock (less than \$50) or a house's environmental controller. The time clock or controller can be programmed to activate the dump valves to flush the pad systems in the middle of the night when they are not operating. Though ideally, a solenoid would be installed on the water line feeding the pad systems to shut off the water while valves are dumping the system, typically the valves dump the water quickly enough that it is not problematic. As is the case with evaporative cooling system pumps, the valves should be removed during the winter to prevent damage due to freezing.

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