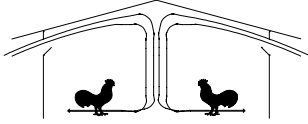




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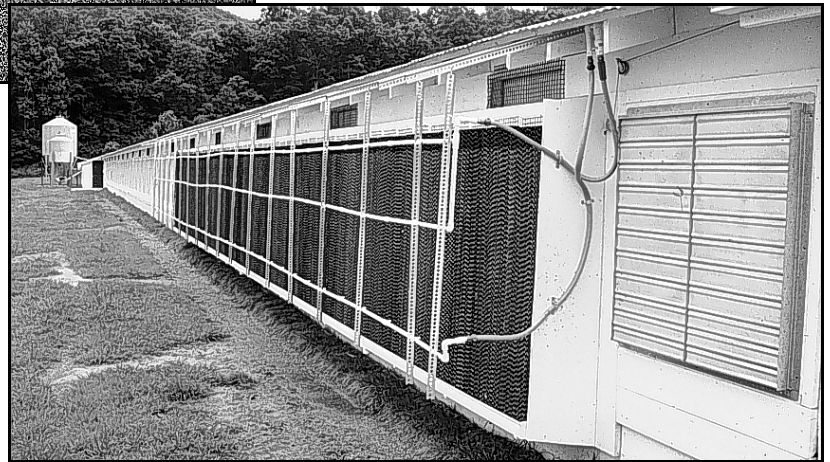


# *Poultry Housing Tips*

**Evaporative Cooling Options for Tunnel-Ventilated Houses...an Overview**

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Five to ten years ago selecting an evaporative cooling system for a tunnel-ventilated poultry house was fairly simple. The decision was easy because a producer only had two real choices. He could spend about \$1,000 dollars for a low pressure fogging system that produced five to eight degrees of cooling or \$6,000 for a traditional evaporative cooling pad system that produced up to twenty degrees cooling. Though most producers wanted the twenty degrees cooling, they usually settled for the less costly five to eight degrees produced by a low pressure fogging system.

Today it's a different story. There are low and high pressure fogging systems, four types of fogging-pad systems (new ones are coming out every day), and at least two different types of traditional evaporative cooling pad systems. In fact, there are so many different options for producers that making a decision on which system to install can be frustrating.

Which system is the best? It all depends on how much you have to spend, how much cooling you want, and what types of problems you are willing to put up with. The following is an overview of the advantages, disadvantages, "relative cost" and the amount of cooling produced by the different systems.

#### ***Low Pressure (100 psi) vs. High Pressure (200+ psi) Fogging Systems:***

Low pressure fogging systems typically offer five to eight degrees cooling at minimal cost. The downside, other than the fact they don't cool a lot, is that they often wet the litter, birds and equipment. High pressure fogging systems on the other hand can produce up to 12°F cooling with minimal house wetting. This is because the high pressure tends to break up the water droplets into finer particles, hastening evaporation, which of course increases cooling and minimizes house wetting. On the negative side, a typical tunnel-ventilated house with a good high pressure fogging system will be equipped with close to 200 nozzles, which if you have bad water quality can be a maintenance nightmare. Furthermore, many producers get a little nervous about the 200 psi booster pump and what might happen if a pipe breaks or a joint lets loose.

#### ***Evaporative Cooling Pad Systems vs. Fogging Systems:***

There are primarily two types of evaporative cooling pad systems: fogging-pad and traditional circulating pad systems. The only real difference between the two types of systems is the way the evaporative cooling pads are wetted. Traditional circulating water evaporative cooling pad systems have been used by segments of the poultry industry for over 20 years. A PVC pipe with small holes is placed above the pads in a shroud that directs the water pumped through the holes onto the top of the pad. The water flows down the pad into a gutter. The gutter collects the water and funnels it into a storage tank. A pump in the tank pumps the water back into the PVC pipe over the pad where the process is repeated. In a fogging-pad system, the pad is sprayed with nozzles located in front of the pad. Any water which is not evaporated typically runs off onto the ground.

The primary advantages of any type of pad systems are that they get the water out of the house and they produce more cooling with less mess and maintenance than traditional fogging systems. Houses with pad systems tend to stay cleaner. In fact, studies have shown that dust collection on equipment can be reduced 70 percent or more with a pad system. Furthermore, because the equipment in houses with pad systems stays drier it will probably last longer than if fogging nozzles were used and electrical shorts are less likely to occur.

Unlike a house with fogging nozzles where the air is continually cooled as it moves down the house, all the cooling in a house with evaporative cooling pads takes place as the air moves through the pads as it enters the house. As the air moves toward the fans it will pick up heat from the surfaces of the house as well as the birds. If the ventilation system is properly designed and maintained and the house is properly insulated and does not have a lot of leakage, the temperature difference can be kept to less than five degrees. If the house is loose and the fans are not properly maintained, the temperature difference can get as high as ten degrees. As a result, evaporative cooling pad systems are better suited to well insulated, tight houses.

Another factor to consider when looking at pad systems is that it is more difficult for exhaust fans to draw air through

evaporative cooling pads than through a curtain opening. Whereas, a house with a fogging system may operate at a static pressure of 0.05", a house with evaporative cooling pads will typically operate at a static pressure of between 0.07" and 0.10" when all the exhaust fans are operating. As a result, it is very important that a house with evaporative cooling pads have exhaust fans that are capable of working under slightly higher static pressures without using excessive electricity. Independent lab tests of fans (AMCA, University of Illinois BESS Labs) can be used to compare different makes and models of fans.

A house with evaporative cooling pads will be slightly more difficult to naturally ventilate. There may be up to 70 feet of evaporative cooling pad at the inlet end of a tunnel-ventilated house. The pads restrict the flow of air into the house when natural ventilation is used causing the air near the evaporative pad end wall to be five to ten degrees warmer than the rest of the house. Furthermore, when using natural ventilation dust can easily clog the pad resulting in higher static pressure and less cooling during the hot summer months. To minimize this potential problem it may be necessary to remove and store evaporative cooling pads from late fall to early spring. It is best if you're going to use natural ventilation frequently to consider the difficulty of removing the pads (i.e., a fiber pad system is more difficult to remove than a 2" or 4" paper pad system).

#### ***Fogging Systems vs. Fogging-Pad Systems:***

Fogging-pads offer producers a way to get the nozzles out of the house, produce a fair amount of cooling, and keep initial cost relatively low. Fogging-pads are easier to manage than fogging systems because if they are overused all you end up with is a puddle outside the house which of course is much better than having one inside the house. Bottom line, fogging-pads can produce as much or more cooling than a fogging system, and they keep the water out of the house.

There are a number of potential problems with fogging-pads. The first is cost. Depending on the type of fogging-pad selected, you can expect to spend up to four times as much for a fogging-pad system as for a low pressure fogging system. Fogging-pad systems can use or waste a lot of water. The average fogging-pad system can use as much as eight gallons of water each minute. If all the nozzles are used at the wrong time, nearly eight gallons per minute can end up on the ground outside your house. Four inch fogging-pad systems may require as many as 400 nozzles. Though they are close to the ground, the fact remains that there are still 400 nozzles to take care of. As with any pad system, you will eventually have to replace the pad which can cost between two and five dollars a square foot.

#### ***High Pressure vs. Low Pressure Fogging-Pad Systems:***

There are fogging-pad systems on the market that are designed to operate with only 30 to 40 psi of water pressure (2" paper pad). The low pressure system uses slightly fewer, higher output nozzles than the typical high pressure fogging-pad systems. The high flow rate nozzles are somewhat less likely to clog, and since there are fewer of them, maintenance problems would likely be reduced. The system operates at such a low pressure that a relatively expensive high pressure booster pump is not required and of course you don't have to worry about PVC joints separating because of the high pressure.

The downside of the low pressure system is that it would be difficult to put a few nozzles inside the house to minimize the slight temperature difference that can occur between the pad and the exhaust fans during extreme weather without wetting the house. The cooling produced by a low pressure fogging pad system is a little lower because you do not have as much cooling of the air before it hits the pad because the mist produced by the nozzles is not as fine. Furthermore, a high pressure system is a little more flexible than a low pressure system because the amount of water sprayed on the pad can be changed by varying water pressure. For example, on moderate days a high pressure fogging pad system can be operated at line pressure (40 psi) and on hot days the pump can be used to provide maximum cooling (200 psi).

#### ***Paper Pad vs. Fiber Pads:***

Many of the original fogging-pad systems used a fiber or "hogs hair" pad instead of paper pads. Fiber pads resemble

air filters and produce about the same amount of cooling as a 2" paper pad . The biggest advantage of using fiber pad over a paper pad is cost. Fiber pads costs about 1/4 to 1/3 (per square foot) as much as a 2" paper pad.

On the negative side, fiber pads tend to restrict air flow more than paper pads. As a result 20 to 30 percent more pad area is required on a house. Fiber pads are more difficult to uniformly wet, are more prone to clog with dust, and do not hold up as well as paper pads. Whereas paper pads should last at least five years, fiber pads should probably be replaced at least every two years to insure maximum cooling and air flow.

#### ***Fogging-Pad vs. Traditional Evaporative Cooling Pad Systems:***

A properly designed, installed and maintained traditional evaporative cooling pad system may be the most ideal system. They can produce up to 20 degrees cooling and usually require relatively little maintenance. There are no fogging nozzles to worry about, and any water which does not evaporate gets recirculated so you do not have to worry about runoff.

Of course the down side is the relatively high cost and even though the water flowing over the pad gets recirculated, water usage can exceed ten gallons of water per minute. Houses with high efficiency evaporative cooling pads tend to be very humid, over 75 percent. If not maintained properly, the pads can become clogged. A clogged pad may reduce air flow in the house by 30% or more leading to reduced windchill effect and large temperature differences between the pads and the exhaust fans. In a house with a fogging pad this clogging is slightly reduced by the fact that the spray from the nozzles tends to clean the pad. Pads typically last about seven years (if taken care of). Replacement pads cost as much as six dollars per square foot.

#### ***Traditional Evaporative Cooling Pad Systems (low efficiency pads vs high efficiency pads):***

There are two types of evaporative cooling pads used in traditional evaporative cooling pad systems - high efficiency and low efficiency. The high efficiency pad, with the ability to reduce air temperatures 20 degrees, is by far the most popular type of pad used. The low efficiency pads produce less cooling than the high efficiency pads, approximately 10 to 12°F, but are less restrictive to air flow, produce less humidity, and are easier to maintain and clean.

### **Factors to consider when choosing an evaporative cooling system:**

#### ***Water Quality:***

Water quality often narrows down the evaporative cooling options available to producers. In areas where water quality is very poor it is probably best to stay away from high pressure fogging systems. The high pressure, low volume nozzles required to produce a fine mist are prone to clogging, and considering the fact that they are usually very difficult to access, they sometimes result in significant maintenance problems. With a high pressure fogging-pad system, the nozzles are within easy reach making maintenance a little easier. A low pressure fogging-pad system may be a better alternative if water quality is questionable because low pressure, high flow rate nozzles are less prone to clogging. A traditional evaporative cooling pad system would be another good choice, primarily because there would be no nozzles to clog. Mineral buildup on the pads can be kept to a minimum through proper pad maintenance.

#### ***Water Availability:***

You may want a system that produces 20°F cooling, but do you have enough water available? More cooling requires more water. To reduce the temperature of the incoming air 10°F, you must evaporate approximately 25 gals/hr per 48" fan operating. And, as you might expect, to reduce the temperature of the air in the house 20°F requires 50 gals/hr per 48" fan. On a broiler farm with four 500' houses (nine 48" fans per house) an evaporative cooling system that produces 20°F cooling would require a well capable of pumping approximately 40 gallons per minute (7.5 gal/min for the pads and 2 gal/min for drinking purposes for the birds).

A traditional evaporative cooling pad system is probably the most efficient user of water. Since water which is not

evaporated is collected and reused, water usage is approximately 20 to 30 percent less for a given amount of cooling than in either fogging or fogging-pad systems.

**Usage:**

The greater number of weeks a year a producer requires an evaporative cooling system, the more consideration should be given to how much maintenance a system requires. For instance, producers in hot climates who raise breeders or large broilers should probably stay away from interior fogging systems due to the large amount of time required to maintain nozzles and cleaning damp dust off of equipment and fans. On the other hand, if a producer is raising 4 lb birds in an area where hot weather is not typical, a high pressure fogging system will probably be sufficient. Likewise, producers with large numbers of houses or other significant farming responsibilities should opt for lower maintenance systems.

**Final factors to consider:**

- 1) Air moving capacity is crucial to the success of a tunnel-ventilated house. In fact, it is twice as important as the evaporative cooling system. Do not sacrifice fan performance by failing to install adequate amounts of evaporative cooling pad.
- 2) The more pad you put on a house the greater the windchill effect, air temperature reduction, water usage, and cost.
- 3) The more cooling, the more it's going to cost.
- 4) More cooling equals more humidity. Reducing the temperature of the incoming air by 10°F will cause humidity to go up 20 percent. Reducing incoming air temperature 20°F will result in the relative humidity of the incoming air increasing 40 percent.

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Provided to you by:

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## Evaporative Cooling Options for Tunnel-Ventilated Poultry Houses

### Fogging Systems

*cooling:* 5 to 12°F  
*cost:* \$800 to \$1,600  
*benefits:* low cost  
easy to install  
*problems:* wet house and  
equip.

### Pad Systems

*cooling:* 10 to 20°F  
*cost:* \$3,000 to \$8,000  
*benefits:* water out of house  
high cooling  
*problems:* high cost

### Low Pressure (100 psi)

*cooling:* 4 to 6°F  
*cost:* \$800  
*benefits:* low cost  
*problems:* very wet house

### High Pressure (200 psi)

*cooling:* 8 to 12°F  
*cost:* \$1200 to \$1,600  
*benefits:* moderate cooling  
*problems:* approx. 200 nozzles  
high press. water lines

### Fogging Pad Systems

*cooling:* 10 to 20°F  
*cost:* \$2,500 to \$6,000  
*benefits:* relatively low cost  
*problems:* many nozzles  
pad water runoff

### Traditional Circulating Water Pad Systems

*cooling:* 10 to 20°F  
*cost:* \$5,000 to \$8,000  
*benefits:* no nozzles  
no runoff  
*problems:* high cost  
algae growth

### High Efficiency Pad System

*cooling:* 14 to 20°F  
*cost:* \$6,000 to \$8,000  
*benefits:* high cooling  
*problems:* clogged pads  
high static press.  
high humidity

### Low Efficiency Pad System

*cooling:* 10 to 12°F  
*cost:* \$5,000 to \$7,000  
*benefits:* lower static pressure  
lower humidity  
easier to clean

### 2" Fiber Fogging-pad

*cooling:* 10 to 12°F  
*cost:* \$2,500  
*benefits:* low cost  
*problems:* pad clogs  
short life  
(2yrs)

### 2" Paper Fogging-pad (high press.)

*cooling:* 10 to 12 F  
*cost:* \$3,400  
*benefits:* longer life pad  
less static press.  
*problems:* ?

### 4" Paper Fogging-pad

*cooling:* 14 to 20°F  
*cost:* \$5,000  
*benefits:* high cooling  
*problems:* high cost  
300 nozzles +  
high static press.

### 2" Paper Fogging-pad (low press.)

*cooling:* 10 to 12°F  
*cost:* \$2,900  
*benefits:* low static pressure  
long pad life  
no high pressure pump  
*problems:* ?