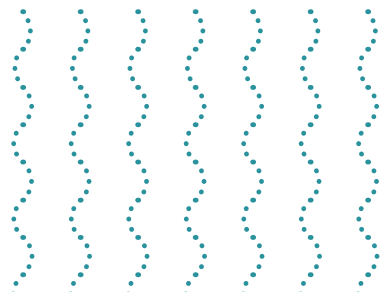


Evaporative Cooling Options

During the most intense summer heats, shading and everyday ventilation may not be enough. Consider designing an evaporative cooling system to take things to the next level.



By Tonya Lofgren



Shading and natural or mechanical ventilation will cool your greenhouse to an extent, but you will likely need to add an additional cooling source during the peak hours of summer. Two popular options for additional greenhouse cooling are a combination pad-and-fan system or high-pressure fogging system. Both options use the method of evaporative cooling, which uses the heat in the air to remove and absorb water. Evaporative cooling causes that chill you feel when you get out of a swimming pool. With a properly designed system, the air inside your greenhouse can be up to 20 degrees cooler than the air outside.

Pad-and-Fan Combination System

With a combination system of evaporative cooling pads and exhaust fans, the pads are installed along the side or back wall of your

house with exhaust fans located on the opposite wall. A sump pump is used to pump water to the top of the pad through a supply pipe. Water is then forced through small holes along the length of the supply pipe and deflected off the top cover where it flows down and through the pad. While the water is flowing through the pad, air is pulled or exhausted through the wet pad with a series of large exhaust fans or shutters on the opposite side of the building. Any water that is not evaporated is collected in the holding tank underneath the pad and recycled back through the system, back up to the top of the pads. A self-contained system uses the return trough as the holding tank. An external system uses a separate, often open tank, similar to what you would use to water a horse. An automatic float valve located in the tank matches the water supply with your cooling demands.

It is important to install a filter with your pad-cooling system to remove impurities in the water. Calcium, lime and other trace minerals do not evaporate with the water and get left behind. These deposits will build up and can eventually clog the pad. If a pad area is partially or totally clogged, the air flow through the pad is decreased and reduces your cooling ability. Environmental controls and thermostats used along with the system allow the operator to monitor and adjust the fan cycles for optimum growing conditions.

Variations in Pad Materials

Although there are variations in pad material, the most common and widely accepted type of pad in the greenhouse market is constructed of corrugated cellulose. The layers of cellulose material are glued together in a way that allows air to pass through the layers when it is pulled through by the exhaust fans or shutters.

Typical greenhouse cooling pads are 4 or 6 inches thick and can come with a variety of different angled flutes, or air channels. The recommended pad thickness and flute angle for your system will depend upon your application and geographical area. It is best to consult with your local manufacturer or horticultural supplier for the proper recommendation.

Pads are also offered in untreated and treated (coated) variations. Treated pads, the most common, have added stiffening agents and are more resistant to algae and microorganism growth. While treated pads usually cost more up front, they are much more durable during cleaning and have an increased life expectancy over untreated pads.



This self-contained evaporative-pad cooling system from J&D Mfg. includes the holding tank, sump pump and filter all in one complete system.

High-pressure fogging is another method of evaporative cooling that is effective at controlling the temperature in your greenhouse.

Pad Maintenance

Because some of the water that recirculates through the cooling system evaporates each time it flows through the pad, the salt and mineral concentration of the water increases over time. The entire system must be cleaned and maintained on a regular basis for maximum efficiency. Here are a few suggested guidelines from J&D Manufacturing for maintaining your evaporative pad cooling system. With proper maintenance, your treated cooling pads should have a lifetime of seven to 10 years.

- Maintain a pH level between 6 and 8 to preserve the structural integrity of the pad.
- Remove and gently brush pads with a soft-bristled brush, then flush the system to remove debris. During operating season, clean and flush every four to six weeks.
- When the pad system is operating periodically, check for any dry spots that may appear. If you see any spots, check for clogged holes in the supply pipe that are preventing water from being released.
- When using a pad-and-fan combination system, run the fans for a few minutes after shutting off the pad system to pull all remaining water through the pads. This will allow the pads to dry fully and prevent algae growth.
- Completely dry the cooling pads once every 24 hours.
- Maintain a water bleed-off rate of 3 to 5 percent per day.
- Ensure the sump tank is fully enclosed to prevent debris collection. Clean the sump tank biweekly.
- Clean water filters on a weekly basis.
- Algaecides and mineral prevention aids may be used with the pad cooling system.

High-Pressure Fogging

High-pressure fogging is another method of evaporative cooling that is effective at controlling the temperature in your



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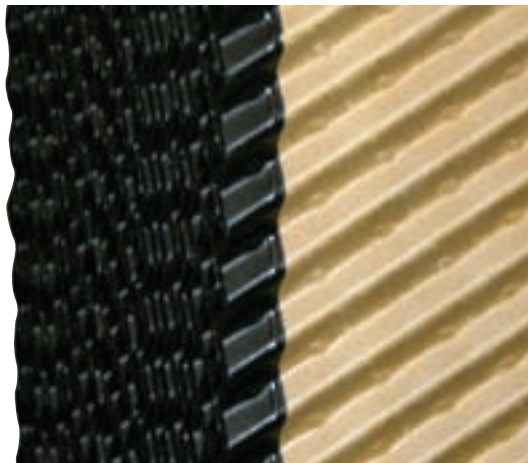
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Treated or coated pads have a longer life expectancy and hold up to cleaning better than untreated versions.

greenhouse. One weakness of a pad cooling system is the location of pads relative to the exhaust fans or shutters. The air is coolest as it is coming through the pad, and may increase slightly in temperature as it is drawn through the length of your greenhouse towards the fans. With high-pressure fogging, a nozzle can be installed for every 50 to 100 square feet of the growing area to create a more uniform temperature throughout your house. A high-pressure fog system is quieter to run, uses less water than a pad cooling system and is often less expensive to install. It often requires no structural modifications to get a high-pressure fog system up and running.

Because the nozzles are so small, it is essential to install a proper filtration system and high-pressure pump with your fog system to prevent premature clogging of the nozzles.

Designing Your System

You should always consult a trusted manufacturer with qualified engineers when researching and designing a system. They can help you choose the most effective method for your greenhouse. A good designer or manufacturer will begin by asking you about the location and size of your house, direction of summer winds, and location and arrangement of existing fans. It is important to note that when cooling systems are performing below expectations, increasing the number of fans or the number of nozzles in your greenhouse may not necessarily increase its cooling potential. To maximize your production and stretch your dollar, you should address all issues in the initial design process. [GPN](#)

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