

Evaporative Cooling, Part 2: Maintenance

As discussed in the April 2022 issue of GPN magazine, there are two major types of evaporative cooling used in greenhouses: fan-and-pad or fog systems. The process of evaporation absorbs energy from the air, which decreases the air temperature. There are several factors that influence the rate of evaporation (and thus efficacy of cooling), including the amount of water vapor already in the air relative to what it can hold (relative humidity or vapor-pressure deficit), air velocity and surface area of the water being evaporated. These are all influenced by the outdoor environment and the design and maintenance of a greenhouse cooling system.

Evaporative cooling systems are only as good as their design and maintenance. Even a well-designed cooling system will be less effective without periodic maintenance, especially for fan-and-pad systems. Part 1 of this article provided an overview of greenhouse evaporative cooling methods. Here, general maintenance guidelines of those systems are discussed.

First and foremost, follow the maintenance guidelines for your system from the manufacturer or supplier.

Regardless of cooling system type, the quality of water has a large impact on maintenance frequency. Unless “pure” water is used (reverse osmosis or deionized water), minerals will accumulate in systems (pipes, pads, nozzles, etc.), especially calcium.

Water evaporates as pure water and leaves the mineral solids behind. Therefore, treating the water supply before it enters the cooling system may be worthwhile. When your water is moderately to highly alkaline, creating “pure” water, or mixing it with your water to dilute its alkalinity, could be worthwhile.

Fan-and-pad systems. Although these systems are typically less expensive to install, they have more parts and thus require more maintenance than fogging systems. The following are some of the major maintenance suggestions:

- Routinely check that other greenhouse vents and doors are closed when air is being pulled through the wetted pads; otherwise, the efficacy of the system decreases dramatically.
- Pads that are directly exposed to the outdoors may need to be screened to prevent accumulation of debris (such as cottonwood seeds). Clean these screens as needed to ensure good air flow to the pads.

- Drain, flush and sanitize (using labeled disinfectants) all parts of the water distribution system every three to four months of use.
- Analyze the distribution of water released at the top of each pad. There should be a thorough and uniform wetting of the pad along its entire length. Adjust the water flow or make other adjustments as needed.
- Control the growth of algae as much as possible by first, operating fans without the pads for at least 30 to 60 minutes at the end of each day so that they dry out; second, excluding light from the water tanks and distribution systems; and third, ensuring fertilizer solutions do not enter the system.
- Water collected at the bottom of the pads should be screened before reuse. These screens need to be periodically cleaned or replaced.
- A continuous, small amount of water should be discharged from the tank and replaced with fresh water to control the accumulation of minerals that leads to scale.
- Pads need to be periodically replaced because of the buildup of salts in the water, algae or both. Inadequately maintained systems will need more frequent pad replacement.
- Inspect all components of exhaust fans (blades, shutters, motors, belts, etc.) to ensure they are clean and working properly. Repair or replace as warranted.

Fog systems. Fog can be used for cooling in the summer as well as during propagation in the winter. A well-designed and installed system needs relatively little maintenance, as outlined below:

- Every spring and with the pump on, inspect the pump area and plumbing system to check for water leaks, paying special attention to connections.
- After every few months of use, turn the system on and check that each nozzle is properly functioning. Change the fine-particle filter (if present) or replace nozzle as needed. Inspect any other filters in the system and replace when warranted.
- Have a maintenance professional service pumps and water purification systems (when present) every six to 12 months of use.

Well-designed and maintained cooling systems create a cooler greenhouse environment, which usually improves crop quality, mitigates heat delay of flowering and creates more pleasant working conditions. Poorly designed or maintained systems are less effective and may be a waste of energy and water. [gpn](#)



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