

GROWERTALKS

Features

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Improve Greenhouse Heating Efficiency

Michael Kovalycsik

Proper heating is one of the most important components of a successful greenhouse business. That's why a problem with a heating system can mean disaster for growers. Here's a look at some common greenhouse heating problems and ways to avoid them.

Improper maintenance

One of the best ways to ensure a healthy lifespan for your heating system is to perform proper maintenance. Often, growers get so busy during peak season, maintenance gets pushed to the back burner.

"In my experience, talking to growers who have had heating unit failures, they'll sometimes admit that it's been two or three years since they actually looked at the unit," says Paul Thomas, professor of floriculture at the University of Georgia. He recommends inspecting heating systems yearly at minimum, but preferably twice a year.

Not budgeting for a new system

You know your greenhouse heating system is on its last legs, but you're hoping to get one more year out of it. Sound familiar?

"People tend to use these [greenhouse unit] heaters until they fall apart and that's a recipe for disaster," said Paul.

If a heater breaks in the middle of a crop, a grower can easily lose tens of thousands of dollars in product. Paul recommends all growers build the cost of a heating system replacement into their business plans.

"There is a lifespan for these heaters," he says. "Whatever the manufacturer says is the standard lifespan—whether it's five years or 10 years—you need to believe that."

Pictured: Growers can save on heating costs in the long run by investing in a new, efficient heating system, such as a radiant floor heat system.

While budgeting for a new greenhouse heating system can seem daunting, it's important to consider the immediate and long-term benefits of a new system. For example, hydronic radiant floor and bench heating systems, like those offered by Delta T Solutions, are highly efficient, compared to unit heaters.



Unlike forced-air heating systems, which lose a significant amount of heat in the air, hydronic floor and bench heat warms the plants at the soil level. As a result, the plants get warmth where they need it most, reducing energy use and resulting in healthier plants. Plants also germinate faster when heated at the soil level, which results in quicker turns for improved efficiency and a faster return on investment.

If your operation is in the market for a new heating system now or in the next few years, it's important to first find out where your current heating inefficiencies lie.

Growers of all sizes can benefit from an energy audit to not only identify any areas that need to be closed up for the winter, but also to evaluate the efficiency of current heating systems. A good place to start is to download the heat loss calculator (www.deltatsolutions.com/docs/heat_loss.xls) provided by Delta T Solutions. This convenient tool allows you to find out exactly where and how you can save energy.

The heat loss calculator is easy to use and takes the average grower five to 10 minutes to complete. The resulting information is highly beneficial, providing knowledge about your operation's exact heat loss.

For example, if you know your true heat loss and are in the market to replace your current heating system, this knowledge means you won't invest in under-sized or over-sized heating equipment. Having the right heating system for your operation can not only save money, but improve overall plant health.

Heating Tune-Up Checklist

John Bartok, University of Connecticut extension professor emeritus and agricultural engineer, recommends having a competent service person clean and adjust all greenhouse boilers and furnaces at least annually. Here's a list of some of John's recommended tasks for proper heating system upkeep:

- Make sure you're using the correct fuel. Using the wrong fuel grade or type can cause carbon accumulations, which can decrease heat transfer.
- Protect fuel oil tanks. Dirty fuel is to blame for 20% of service calls. Keep tanks away from dusty areas and use watertight fittings. Make sure tanks are enclosed or protected so fuel doesn't get too cold.

- Remove soot from inside the boiler or furnace. A soot deposit as small as 1/8-in. can increase fuel usage by 10%. Use a wire brush or vacuum to clean surfaces.
- Change fuel filters. Clean fuel means more efficient combustion. Be sure to replace the oil filter each time the furnace is cleaned.
- Use correct nozzle size and angle. A nozzle that's too big or too small will result in excessive fuel consumption.
- Clean and adjust controls. Check gas valves, thermostats and ignition mechanisms, as well as safety valves, low water regulators, limit switches and stack controls.
- Oil the bearings, motors and pumps. This will increase their lifespan.
- Inspect belts. Clean fans and blowers and check belts for wear and correct tension.
- Check air filters. Clean or replace filters to ensure maximum air flow.
- Clean water. Drain dirty water through drain cocks in steam and hot water systems. Flush steam boilers to remove scale and lime deposits. Analyze boiler water regularly to determine if treatment is necessary.
- Check combustion efficiency. The lower the stack temperature, the lower the fuel consumption. The higher the carbon dioxide content in stack gases, the more completely the oil/gas is being burned. Also monitor smoke and soot content in flue gases.
- Check flue stacks. Flue stacks should extend at least 2 ft. above the greenhouse ridge. The top of the flue stack should be at least 8 to 12 ft. above the furnace. Use a cap to prevent backdrafts and air pollution injury to plants. Also make sure the flue stack is tight. Any air leaks will chill the gases, reduce the draft and potentially cause plant injury if flue gases enter the greenhouse. Make sure the flue stack is the correct size by following the manufacturer's recommendations. A flue stack that's too small or lined with soot will reduce draft. A flue stack with too large a diameter will cool the gases too quickly.
- Control draft. Install a draft regulator to stabilize draft variations from atmospheric conditions.
- Inspect radiator valves. Repack leaky valves and replace defective ones for fuel savings
- Clean radiators and pipes. Dust and dirt increase fuel consumption by reducing heat transfer.
- Insulate distribution lines. Insulate pipes in unheated areas and underground to reduce heat loss.
- Check thermostat placement. Put the thermostats at plant height away from heat pipes and hot air streams. For the most accurate temperature control, shade and aspirate thermostats. Install an electronic thermostat with a $\pm 1^\circ\text{F}$ differential to more accurately control temperature.
- Check furnace and fan thermostat differential. Set exhaust fan thermostats at least 10 degrees above the heater thermostat to prevent simultaneous operation and backdraft. **GT**

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