

grower 101

Techniques for Fighting Rising Energy Costs

Faced with increased material costs, labor issues and rising energy prices, growers are looking to gain a competitive advantage.

By Patricia Dean



Top: Many growers are now installing dual curtains to reduce energy consumption. Bottom: Installing roll-up walls with durable drive units can offer growers a long-lasting automated solution to energy consumption.

The industry has seen a surge in growers upgrading their greenhouses to make them more efficient. Innovative companies recognize the need to invest in the future. Some of these enhancements include installing energy curtains, upgrading environmental controls and automating vent operation such as roll-up wall systems.

This article will examine the benefits of these various cost-saving solutions and analyze them using the USDA Virtual Grower program.

Proven Savings with Curtains

Energy curtains first became popular during the energy crisis of the 1970s. Today's systems offer improved design and fabric selection. The investment in a curtain results in immediate energy savings. Studies by Rutgers and the USDA have shown that energy consumption is reduced by 30 to 40 percent. And now there are software programs that can help growers perform their own heat calculations. This helps determine the return on investment by comparing the heating costs for a greenhouse with an energy curtain against one without a curtain.

The savings are so evident that many growers are now installing dual curtains to

take full advantage of the systems. Depending on their crops and locations, growers might choose a blackout curtain and a shade system, or they might want a clear covering that allows light but provides heat retention in conjunction with an open-weave fabric to be used for cooling.

If improved crop quality and energy savings aren't compelling enough, there are grants to further encourage growers to incorporate innovative technologies that improve energy efficiency and reduce pollution. The USDA and state and local programs recognize the significant savings and offer programs to help growers with the initial investment.

Single Sensor Equals Savings

Researchers have long advocated using a single temperature sensor to control all heating and cooling equipment, preventing both from operating simultaneously. The sensors on these types of controls are much more accurate than a traditional thermostat. These improved temperature controls allow growers to move from multiple thermostats to a simple four-stage control. The investment is about the same but the savings are substantial — often

hundreds of dollars per month — and, of course, the crops are greatly improved.

Ramping Up

With 80 percent of heating occurring at night, it makes sense to take advantage of night setback. While this technology has been around for a long time, the older controls could not ramp, meaning they didn't offer a gentle transition between day and night temperature settings. The abrupt transition between temperatures resulted in a dump of heated air instead of gently allowing the air to cool naturally as the temperature drops.

Most new controls have the ability to manage the rate of the temperature change between day and night. "Growers with the older STEP controls like the STEP 50A or STEP 500 have upgraded their systems, adding features like ramping," says Amanda Debevc of Wadsworth Control Systems. "We specifically designed the EnviroSTEP control to use the same cabinet as the STEP 50A to allow an easy transition."

Laboring Away

Growers with roll-up walls are looking for long-lasting automation solutions. Many

Virtual Grower Case Study

The following is a case study to show how the Virtual Grower program works.

The sample greenhouse:

- 60x96 foot gutter-connected two-bay greenhouse with double-poly covering
- Slightly leaky
- In production from Sept. 1 to June 1
- Located near Allentown, Pa.
- Uses oil at a cost of \$2.60 per gallon

Researchers used Virtual Grower to determine the payback for a greenhouse using a control with night setback and an energy curtain.

The Virtual Grower can show how much a climate control can reduce energy

costs. Because 80 percent of heating occurs at night, lowering the temperature can result in significant savings. While it is tempting to lower the temperature just to save money, consider that it can lengthen the crop cycle time depending on what is being grown. Research has found that most crops will be ready on schedule with a lowered night temperature. The Virtual Grower program calculates heating costs as well as the temperatures' impact on the crop.

The program also can show how much an energy curtain can reduce energy costs. We've all heard that curtains can save 30 to 40 percent on energy consumption. The Virtual Grower tool can help growers do their own heat calculations, illustrating the difference between heating a greenhouse with an energy

curtain and using one without a curtain. The program actually calculates the savings using factors such as the average outside temperature for the specified location.

The Virtual Grower's analysis on a greenhouse in Allentown, Pa., assumed that the curtain covered the greenhouse at night and opened the curtain in the morning and remains that way for the entire day. The data showed the heating costs dropped drastically. In Allentown, heating costs decreased \$8,108. If coupled with a control that offers a night setpoint, set to 60° F in this example with ramping, the savings can be \$12,350.

Energy curtain costs vary depending on the greenhouse size and design. But for this sample greenhouse, the system costs would be about \$10,500 plus installation. Considering rising energy costs, the payback would offer tremendous savings for decades.

Set point day temp 70° F No night setback temp No curtain	Set point day temp 70° F Set point night temp 60° F No curtain	Set point temp 70° F No night setback temp Has energy curtain	Set point day temp 70° F Set point night temp 60° F Has energy curtain
Total heating costs: \$29,824	Total heating costs: \$23,058	Total heating costs: \$21,716	Total heating costs: \$17,474
Heating cost per sq. ft.: \$5.18	Heating cost per sq. ft.: \$4	Heating cost per sq. ft.: \$3.77	Heating cost per sq. ft.: \$3.03
Maximum BTU draw on all heaters: 475,595 BTU/hour	Maximum BTU draw on all heaters: 474,993 BTU/hour	Maximum BTU draw on all heaters: 474,993 BTU/hour	Maximum BTU draw on all heaters: 474,993 BTU/hour
	\$6,766 savings Installed an environmental control with night setback Used a night set point of 60° F	\$8,108 savings Installed an energy curtain	\$12,350 savings Installed an energy curtain and an environmental control with night setback Used a night set point of 60° F

growers are moving away from hand crank sidewalls toward automation. Some choose tube motors because of the low initial cost. However, most switch over to using a durable drive unit because they realize the installation and replacement costs for the tube motor exceed the expense of a durable motor that will last for decades.

McCrory's Sunny Hill Nursery in Eustis, Fla., uses Wadsworth VC 2000 drive units for their roll-up walls. "The up-front cost is a bit higher with tube motors, but this approach has an excellent return on investment because the units last for decades," says Mark Sineath, head grower at McCrory's. "The retrofit costs about \$1,200 per drive unit, which isn't bad when you consider that one Wadsworth motor is replacing two tube motors that cost \$800."

As the cost of doing business increases, it is critical to make smart investments that will result in a reduction in overall costs and improve the crop quality. Those who recognize these imperative actions will be successful.

Evaluating Energy-Saving Options

There are plenty of options to lower energy costs, but how do you evaluate them to determine your return on investment?

The USDA's Virtual Grower software offers assistance. This calculator can help determine your energy use and the final cost of heating your

greenhouse. The program is already powerful, and developers are constantly making enhancements to improve its accuracy. Best of all, it's available free of charge at www.ars.usda.gov/services/software/download.htm?softwareid=108.



Upgraded environmental control systems offer ramping, which is a gentle transition from day to night temperature settings. (Photo: Jane Bergantz)

With Virtual Grower, you can simulate different scenarios for reducing energy consumption: replacing film, fixing leaks, and installing an energy curtain or a new environmental control. You can use the data from your Virtual Grower analysis to calculate your return on investment for different solutions. Simply plug

in the information, and you can see how much money you'll save.

The latest version of the program has many enhancements; perhaps most exciting is the ability to look at the impact of temperature and CO₂ scheduling on plant weight and time to flower.

With a good control, growers can create programs to determine which factor is the priority for their customers. The Virtual Grower reports the weight and time to flower for several crops. Jonathan Frantz, one of the developers of the Virtual Grower program, explained that the CO₂ level came as a result of measuring the level at greenhouses; they found that really tight greenhouses had a very low CO₂ level, which was impacting the plant weight when it flowers.

In addition to crop scheduling, Virtual Grower has improved heat calculations. You can now select what type of fabric is used in your energy curtain system along with more options for analyzing heaters and coverings. [GPN](http://www.gpnmag.com)

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