

Retrofitting Options

From energy curtains to glazings, growers have many choices when it comes to manipulating temperature and light.

by MEGAN BAME

RETROFITTING a greenhouse is all about spending money to save money. In many cases, increased energy efficiency may be the easiest way to see new technologies impact the bottom line. However, the benefit of improved crop performance should not be overlooked as a factor in the bottom line savings (or rather gains) – from faster turns and fewer chemicals to improved labor conditions and reduced disease potential.

Though there are numerous components of a greenhouse where retrofitting may result in greater efficiency, this article will focus on those that influence temperature and light.

Shade Netting

For years, shade netting was available in black with the amount of shade determined by how tightly knit the fabric was woven. The purpose was primarily to reduce heat or light. Over the years, new colors have been introduced, including an aluminum covered fiber, in an effort to manage the light while reducing the heat.

Frank Giglia, general manager of Signature Supply in Lakeland, Fla., explains, “Plants photosynthesize all day, but they only grow when the temperature range is between 60°F and 100°F.” In most parts of the United States, summer greenhouse temperatures can easily exceed 100°F. Aluminet 50 percent, a specialty shade netting, can decrease the temperature by 20°F, while only



The three pots on the left were grown under ChromatiNet Red 50 percent, while the right three (of the same variety) were grown under black shade cloth 50 percent, with identical cutting source, fertilizer, age and soil.

increasing the shade factor by 10 percent. Rather than blocking the sun's light, the aluminum-coated weave disperses light over the plant canopy.

ChromatiNet is a line of colorful fabrics available in red, blue, gray and pearl. The red and blue fabrics specifically address the wavelengths of the light spectrum that affect plant growth and development. Red, for example, increases the diffused light spectrum to 600 nm and higher, maximizing photosynthesis and leading to faster overall growth. On the other hand, ChromatiNet Blue increases the light spectrum in the wavelength range from 425 to 490 nm, contributing to a reduced growth rate (eliminating the need for a chemical growth regulator) and delay of blooms.

The beauty of the colored shade nettings, besides their color, of course, is their ability to match your cultural needs. Giglia used two Florida growers as an example. Both grow New Guinea impatiens, but their growing environments are tweaked with different ChromatiNets to produce the best product for their customers. One grower uses blue to produce compact plants with lots of buds for land-



Under ChromatiNet Blue, plants grow more compact with darker foliage - desirable traits for foliage crops such as this spathiphyllum. Blooming is delayed until plants are removed from the ChromatiNet so blooming occurs at the customer's location.

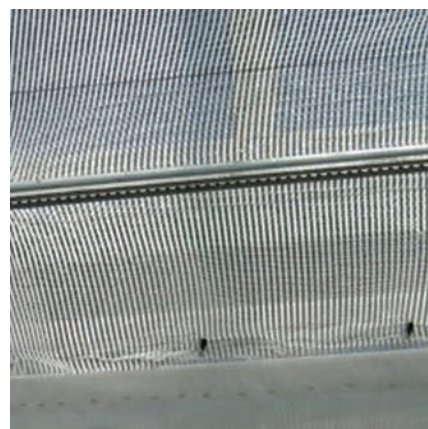
scapers. The other grower uses gray to get blooms as soon as possible so the plants can be shipped to Target.

In either case, a shade netting is a simple retrofit as an exterior covering. It is recommended as a year-round structural component in the southernmost states, and a seasonal addition in northern climates. The shade nettings last four to five years and cost around \$0.21 per square foot. For

more advanced light manipulation, the Aluminet and ChromatiNet coverings can be used in combination.

Energy Curtains

Heat retention curtains have been the biggest category of increased sales in the past year for BFG Supply Co., Burton, Ohio, according to John Urbanowicz, technical service/product manager. Not only do the curtains pro-



Installed between the edge of the greenhouse and the edge of the moving section of curtain, a perimeter seal is a stationary panel of shade cloth at each eave and gutter that overlaps the edges of each movable panel of cloth. This overlap helps prevent cold air from circulating past the edges of the movable panels of cloth. The top photo illustrates fabric not in the perimeter seal, while the bottom photo illustrates fabric properly placed in the perimeter seal.

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vide 20 to 40 percent heat savings in the winter, they also provide cooling shade in the summer.

Urbanowicz says that for new builds, the curtain has become a standard feature. Retrofitting a house with a curtain may require some structural upgrades. Patricia Dean, vice president of customer relations at Wadsworth Controls, Arvada, Colo., agrees that the initial build is "the ideal time to install a curtain system." Wadsworth also has seen a tremendous number of retrofits in the past several years.

The USDA offers a downloadable energy calculator, called Virtual

Coverings

Grower, on the Web (www.ars.usda.gov/services/software/download.htm?softwareid=108). Dean suggests growers use this tool to input their house dimensions, fuel consideration

and temperature settings to assess their potential savings by installing an energy curtain. Simply run one calculation without checking the energy curtain box, then run a second calculation with the energy curtain box selected. The difference will help

growers determine the potential benefit of a curtain system for their facility. Generally, Dean has found that the return on investment occurs in less than three years. Wadsworth promotes the rack and pinion system over the drum and cable system. Dean explains that

Retrofitting Roll-Up Sidewalls

Patricia Dean also reported an increase in use of roll-up sidewalls as growers look to use natural ventilation as an energy saving tool. Traditionally, roll-up sidewalls have been powered by a hand-crank or a tube motor. Neither of these methods is particularly appealing – the hand-crank obviously requires labor and special attention to the climate control, and the tube motors can wear out after a year's use. The yearly replacement costs of tube motors (around \$400 each) was unacceptable to some growers who began looking for a more durable option. Wadsworth's VC 2000 ILS motor is a substantial piece of equipment costing around \$1,100, but should last for at least 20 years.



This 360-foot roll-up system is using one VC 2000 motor.

the system will last seven to 10 years. With no cables to re-tension, the only maintenance (and therefore additional labor costs) associated with the curtain system is annual lubrication.

Dean warns that the labor to install the curtain system can cost as much as the curtain itself, though. Growers with construction experience may forego professional installation, but Dean and Urbanowicz suggest, at the very least, someone with installation experience should be hired to supervise and lead the project.

Urbanowicz cites 54 to 57 percent shade curtains as ones most commonly used by BFG customers. In addition to the typical shade fabrics, Dean also mentioned clear curtains, which allow for all day sunlight penetration while the curtain remains closed to retain heat in the winter. Another specialty

recently introduced Highlux High Impact acrylic sheets that offer more optical clarity by having fewer interior sheet ribs. The ribs are spaced 96 mm (3 ¾ inches) apart, which equates to one third the number of ribs in 16 mm acrylic. Acrylic has long been valued for its high light transmission, but it also offers tremendous weather protection, particularly from hail damage, heat retention and an anti-condensate coating.

In addition to energy savings, shade nets, energy curtains and glazings contribute to improved crop quality, increased worker comfort, decreased water use and humidity and condensation control. In most cases, however, the fuel dollar will dictate the feasibility of retrofitting a greenhouse with energy saving technologies. **GG**

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Energy Check-Up

Have you checked your thermostat lately? For every one degree of improved temperature accuracy, a three percent energy savings will be realized. It is not uncommon for a thermostat to be off by as much as five degrees. One easy way to help maintain temperature accuracy is to clean the aspirator filter/screen monthly.

curtain is made from open weave fabric that provides shade in the summer but lets heat escape through the curtain to the open roof vents.

Glazings

Greenhouse glazings occasionally need to be replaced, and it's a prime opportunity to investigate the latest innovations available. Polyethylene films are now available with anticondensate properties and increased thermal retention. Thermal films are more costly, but have the potential to reduce rising heating costs. Urbanowicz reports that a double layer of thermal film does not double the heat retention. Instead, many growers are choosing to use the thermal film as the exterior layer and an anticondensate film on the interior to maximize the benefits of both technologies.

As for acrylic glazings, DEGLAS