THE RETURN ON INVESTMENT FOR INFRARED GREENHOUSE FILM TYPICALLY TAKES LESS THAN ONE MONTH.

By John W. Bartok Jr.

Save heat with infrared film

IN TALKING WITH GREENHOUSE SUPPLIERS, it is surprising how many growers are still not taking advantage of infrared (IR) plastic film on their greenhouses. Peter Konjoian of Konjoian's Greenhouses Inc. in Andover, Mass., in a recent presentation commented that with the present cost of fuel and the low cost of purchasing IR plastic, a grower could expect a payback of less than one month or about a 2,500 percent return on investment.

Why IR film is better

Energy from the sun enters through greenhouse glazing as short-wave radiation and is converted to heat when the waves strike the plants, floor or benches. This energy is then trapped by the glazing, and the greenhouse warms up. This is the greenhouse effect.

At night the reverse occurs. Heat provided by the heating system is lost by conduction, convection and radiation through the glazing and infiltration of cold outside air through the cracks and openings in the skin of the glazing. Heat loss can be slowed by using double glazing, installing a thermal blanket and sealing up cracks.

The radiation component of the total heat loss is usually about 12 percent. Glass is opaque to radiation losses but polyethylene will allow it to go right through unless some barrier is present. This can be a layer of moisture that has condensed on the inside plastic or it can be an additive that has been placed in the formulation.

Preventing heat loss

Plastic manufacturers have found that mineral-based additives, such as ethyl vinyl acetate (EVA), calcined kaolin clay and special polymers can be added to reduce this radiation loss. With the development of three-layer coextruded film, material with different properties can be combined into a single sheet.

Generally, films that reduce the long-wave radiation to less than 20 percent are referred to as infrared or thermal films. This is sometimes referred to as the thermicity value. The thinner the plastic, usually the less the thermicity.

Research in 1982 by agricultural engineer Bill Roberts and his team

at Rutgers University showed that savings of up to 35 percent could be achieved with IR film under clear sky conditions when compared to conventional films. They concluded that over a heating season the savings might average out to 15-20 percent. This will vary somewhat depending on where in the United States your greenhouse is located and the amount of clear nights in your area.

Additional benefits

Today most plastic film glazing manufacturers produce an IR film. Based on the work at Rutgers, the normal recommendation is the IR plastic be installed as the inner layer. As most IR films also include a wetting agent to reduce moisture dripping, the inside location is best. Some of the mineral fillers used to reflect the radiation back into the greenhouse also diffuse the light. This spreads the light evenly inside the greenhouse reducing shadows and allowing more light to reach lower into the plant canopy. It also helps to average out leaf temperatures at the top of the plant canopy requiring less shading.

Research has also shown that leaf temperatures under the IR film, especially on clear, cold nights, were warmer. This may result in a slightly earlier crop.

The cost of installing IR film

When IR film first came out, it was considerably more expensive than conventional film. Today, as manufacturing techniques have improved and more growers use the film, the cost has dropped to a differential of about 2 cents per square foot. This makes the payback shorter.

Assume a 30-by-96-foot (2,880 square foot) hoophouse is covered with double poly on the roof and polycarbonate structured sheet on the endwalls. The house is located in Connecticut and is operated at 60°F during the night. No. 2 fuel oil is purchased at $4 per gallon.

A comparison is made to replace the inside layer of conventional copolymer film (44-by-100-foot sheet) with a layer of IR film. Both films have a four-year life. Savings with the IR film averages 12 percent for the season.

Cost for the inside layer of IR film is $484.

Cost for the inside layer of conventional film is $404. Additional cost of the IR film is $484 − $404 = $80. Additional cost of IR film per year is $80 ÷ 4 years = $20.

Assume the fuel usage in the conventionally covered greenhouse is 1.25 gallons per square foot of floor area for the heating season. This is based on about 6,500 heating degree days.

Heat cost for the heating season for the greenhouse with the conventional plastic is 2,880 square feet × 1.25 gallons per square feet × $4 per gallon = $14,400.

Heat cost for the greenhouse with IR film is $14,400 − 12 percent of $14,400 = $12,672 (assumes a 12 percent savings per year).

Savings = $1,728 per year.

With a savings of $1,728 per year and a cost of $20 per year, the payback is only a few days. Using this technique, you can calculate the payback for your own greenhouses.

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