Top 10

By emphasizing these considerations, you'll encourage maximum life and payback from your energy curtains.

Energy Curtain Installation Considerations

By Kurt Parbst

There are several critical considerations regarding the selection, maintenance and especially installation of interior thermal or shading screens. Ask your maintenance manager or contracted installer to review this list prior to handling screens or curtains.

The top 10 items to consider are as follows:

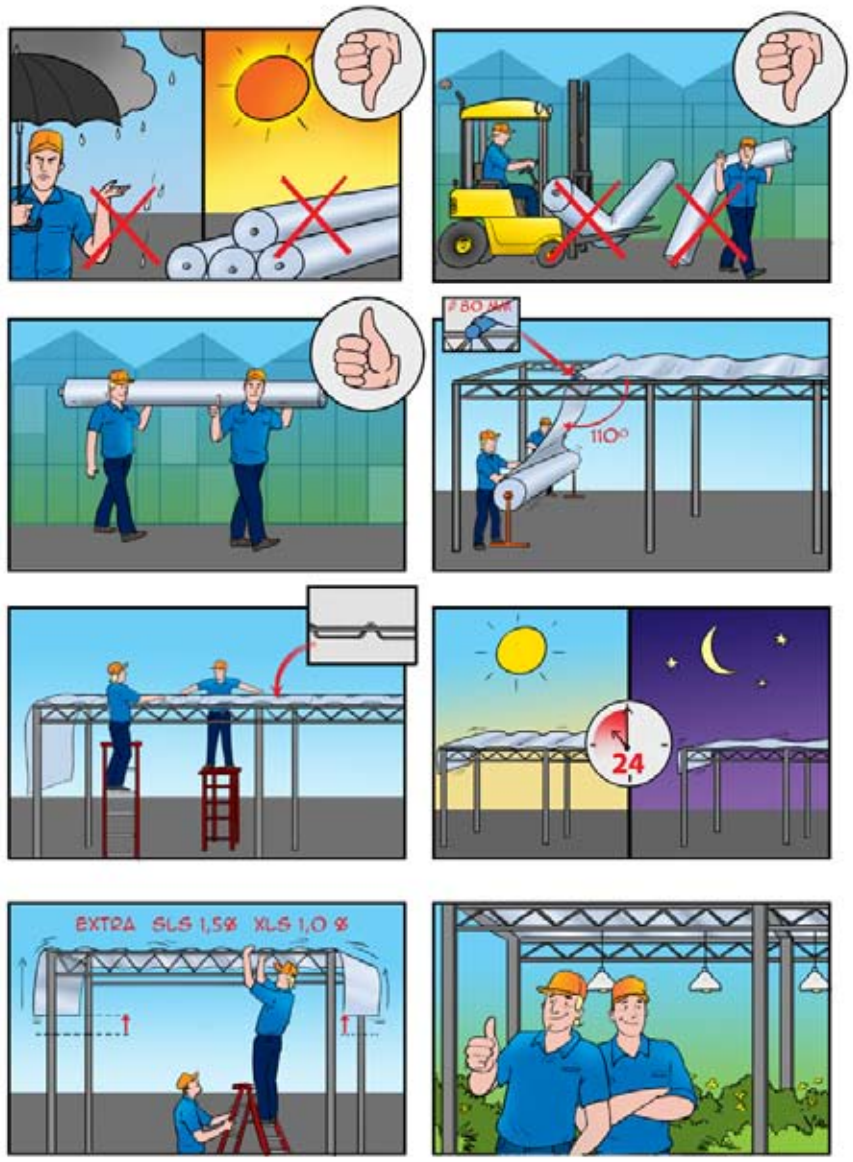
1. Weigh the pros and cons of suspended vs. sliding systems.
2. Obtain a good seal for proper energy savings performance.
3. Identify end of life failure (yarn separation) early to replace prior to next heating season.
4. Ensure proper clearance from potential ignition sources for fire security, from HAF fans to prevent premature fatigue damage, and from mechanical drive equipment (pinching, abrasion) abrasion.
5. Handling and storage prior to use: Don't drag; store in cool dry place.
6. Pull curtain in over an obtuse angle over a large diameter guide to prevent any deformation.
7. Allow tension in cloth to relax before fixing the edges.
8. Allow sufficient shrinkage allowance during installation.
9. High temperature degradation of plastics: Don't cook the greenhouse for disinfection.
10. Replace monofilament wires when the cloth is replaced to prevent abrasion.

The labor associated with installation is a significant portion of the installed price. Make sure it is done right the first time for a long-lasting screen that performs up to its potential.

Nomenclature note: It is confusing to describe the position of a shading screen. Which is open, and which is closed? Covered (deployed) and uncovered (retracted) seem well understood, perhaps even without definition, so we will use those here. The terms "open" and "closed" are better reserved for the construction of the cloth itself. (Open allows air to pass through.)

Selection and Orientation

Open or closed? Generally speaking, there are shading screens and combination energy saving/shading screens. Natural ventilation can escape through shading screens, which provide uniform light transmission across the bench or



floor when they are covered. Energy-saving/shading screens do not allow air to pass through, so they must be parked partially gapped or uncovered to allow natural ventilation to work.

Multiple curtains in a greenhouse are becoming more and more common. One shading screen and one energy-saving/shading screen provides good year-round performance with energy savings and cooling. If two closed energy-saving screens are used, they are often installed in opposing directions so that naturally ventilated houses can be vented through the gap while complete shading is provided.

Suspended or sliding? This has to do with the manner in which the screen system is fastened to the greenhouse.

The suspended method means that hooks have been applied to a reinforced portion of the screen, and this array of hooks is then suspended from a series of stainless steel support wires. While this method removes direct wire-to-cloth contact, thus potentially extending lifetime by removing wear, the original reason was to fold up curtains that travelled longer distances, say 24 to 30 feet, such as may occur with gutter-to-gutter traveling installations. Allowing a deep fold of the cloth (about 6 inches) creates a narrower shading projection. Suspended systems are generally more wind resistant and preferred in open roof, sawtooth vent designs, or particularly exposed greenhouses that admit strong wind.

Sliding systems are more commonly used with truss-to-truss traveling installations where the distance covered may be 10 to 14 feet. Regarding orientation, it is generally beneficial to align the folded bundle of shade curtain north to south so that the shaded projection on the bench or floor travels throughout the day.

Installation

Seal. The most important detail in a thermal screen installation is the last step. A good seal is necessary to provide proper energy savings performance.

The colder, drier, heavier air that will occupy the attic must be trapped by a barrier and

***Left**: High-quality overhang seal.*
***Right:** Pocket seal at break under gutter.*

prevented from falling down the sidewalls, thus dropping the perimeter temperature, potentially wetting the crop and displacing heated, more humid air into the attic.

The mechanical system should provide continuous panel-to-panel (lead edge to back edge) contact. The perimeter should be sealed with fabric devices called pockets or boots. This seal should be flame retardant, as these seals touch every panel creating a conduit in the event of a fire.

Failing to separate the attic from the growing space with proper sealing removes roughly two-thirds of the energy savings potential. Sealing the perimeter of open, shading screens is functionally not necessary but may create a cleaner looking finish.

Separate. Provide clearance between a screen installation and any potential high heat or open flame device such as lamps, unit heaters, CO_2 generators, etc.

Twenty-four inches above the top of the device and the screen is a general recommendation. Use flame retardant screen materials in areas where this clearance is not attainable.

Horizontal airflow fans (HAF) are notorious for creating damage on screens. Two little clearance between fans and screens can allow high velocity air to flutter the curtain. Constant fluttering leads to yarn fatigue much as is noticed at the edge of flags opposite the flagpole. If HAF fans are fluttering your screen installation, direct the airflow pattern downward or drop the fan with longer brackets or chains.

Top: *Sliding installation.*
Bottom: *Suspended or hooked installation.*

Clearance should also be made between the screen and any exposed hardware that may create a pinch or wear point. Screens are textiles that are supple so that they fold into a small shadow projecting bundle. They are no match for continuous rubbing against a bolt head or misaligned cable or wire. The first sign of wear should prompt a closer inspection and adjustment.

Installation day. When new curtains arrive, inspect them for shipping damage and store them in a cool, dry, rodent free location until they are ready to be installed. When they are pulled into place, the screen should be allowed to glide over a smooth, large diameter pipe over an obtuse angle, greater than 110 degrees. If screens are pulled in over wires over a sharp angle, the yarn structure can open allowing the foil and film strips to become wrinkled and twisted degrading the appearance.

Once the screen is pulled in, it should be allowed to rest over one night prior to fastening. The measuring process of the screen involves rolling the fabric under tension onto the core. This tension will relax over a number of hours once it is pulled off of the roll. Otherwise, the tension could create a shrink

condition if the screen is only allowed to relax after it is fastened.

There is a small fraction of shrink that is unrelated to tension. A shrinkage factor should be added to the length of the screen, and this extra material should be distributed over the length of the cloth during the time of installation. This factor can be provided from the screen manufacturer.

Don't Cook the Greenhouse

High temperature conditions degrade all plastics; those in your screens as well as those that may be found in motor seals, control panels, etc. During the day, the attic where a screen is installed is usually considerably warmer than the location of the temperature sensor.

High temperature conditions are not common but easy to achieve in an empty or new greenhouse that is not yet commissioned. Empty greenhouses may have the irrigation turned off and the vents closed. These dry, stagnant conditions lead to tremendously high, damaging temperatures and should be avoided.

It is believed that greenhouses can be "cooked" for thermal disinfection in the summer when they are vacant or students are away. This is a potentially costly practice and not advised.

Schedule Replacement

Screens are generally warranted against UV degradation and shrinkage for approximately five years. They are commonly replaced after eight to ten years of use. Exposure to ultraviolet light weakens the polymers in the yarns that act to hold the textile screen together. Telltale signs of the end of useful life are tears or separations in the longer dimension of the screen. If these tears develop after seven or eight years, it is a mature failure and an indication that the yarns no longer have sufficient strength to hold the screen together.

Further degradation can happen rather rapidly, and it is a good idea to schedule replacement prior to the next critical heating or cooling season. Locate a good installer, and get on their calendar before they become booked for the busy season. Give them sufficient time to order materials, especially if the characteristics are specialized for your crop and may not be stocked locally.

If the installation is of the type that the screen slides atop plastic, usually polyester, monofilament wires, it is a good idea to replace these as well. They may not necessarily appear to be ready for replacement. However, these wires may wear flat where contact is made, creating sharp edges that could cut the new screen. The monofilament wires are generally inexpensive and replaced by pulling the new wires in as the old are pulled out. Gambling that they will last another eight to 10 years seems hardly worth the risk of damaging the integrity of the screen.

By emphasizing these simple considerations, you'll help ensure a worry-free installation and encourage maximum life and payback from your energy curtains. g

Kurt Parbst is president of Ludvig Svensson Inc. He can be reached at 704.357.0460 or kurt@svenssonamericas.com.