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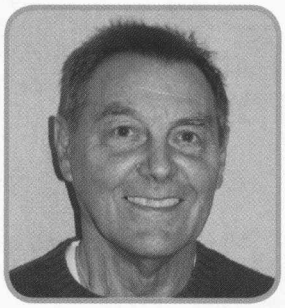

By John W. Bartok Jr.

Save fuel and electricity with energy/shade screens

Energy/shade screen systems are one of the most common conservation measures funded by federal and state grant programs. With a payback of two to three years, these systems provide a good return on the money invested. USDA Rural Development's Section 9007 grant program has been paying 25 percent of the cost of the total installation. Some state programs add up to 50 percent more to the grant. Low interest loans are available for some of the remaining cost.

The Database of State Incentives for Renewables & Efficiency Web site (www.dsireusa.org) provides information and contacts for most of the energy conservation assistance programs in the United States.

Energy saving screens

Energy/shade screen systems can provide 30-50 percent savings in heating costs. Often referred to as energy blankets, they save energy by reducing the heat loss surface area, provide an extra insulation barrier and trap a layer of dead air on both sides of the screen material. If the material contains some aluminum, the infrared heat within the greenhouse is reflected back toward the plants reducing heat loss another few percent. The aluminum strips can also save energy in the summer by reflecting the incoming heat back out of the greenhouse reducing exhaust fan operation.

The typical cost of a screen system is $2-$3 per square foot depending on the size of the installation, screen material installed, number of obstructions that have to be worked around and ease of maneuvering man-lifts in the greenhouse. Energy screens are easiest to install in A-frame and gutter-connected greenhouses.

The standard system uses nylon monofilament or stainless steel cables to support the screen material. The material can either rest on top of the network of cables or be suspended by hooks from the cables. A gear motor powers a drum or rack and pinion that moves the leading edge of the screen material. Control is either with a manual switch or controller that activates the gear motor.

Choose the best system

Gutter-to-gutter systems require less material but form a larger bundle in the open, storage position. They are easier to install as work is done at a lower height. With this system, equipment and plants cannot be supported from the lower truss cord.

Truss-to-truss systems are more common. They can be configured flat at the lower cord of the truss or formed into a slope-to-slope or slope-flat-slope shape to follow the roof of the greenhouse. The latter two may allow heating, lighting and watering equipment to remain in place without having to move it. Flat systems reduce the volume of greenhouse space that has to be heated.

Some growers in northern climates are installing a two screen system. The lower screen has a high energy rating and the upper one is mainly for shade but provides additional energy savings when closed at night. This may provide an additional 10-15 percent greater energy savings. Another variation is to install a clear screen material as the energy saver and keep it extended on cloudy days when there is very little sunlight.

Select the right screen material

The most common materials used for energy screens are composite fabrics of alternating strips of clear and aluminized polyester or acrylic held together by a finely woven mesh of threads. Other materials include knitted and woven bonded polyester, metalized high density polyethylene and polypropylene. Things to consider include the warranty life (usually five to 10 years), strength and flexibility.

Many screen materials are designed to provide shading. For comparison, manufacturers list both the shade factor and the energy sav-

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ings. Shade levels from 5-90 percent are available.

Screens can have an open or closed weave. The closed weave has a higher energy savings and is used in greenhouses with fan ventilation systems. For natural ventilation, an open weave allows the heat to rise through the screen when it is extended. Some growers install a closed weave to obtain the high energy savings and then slightly open the screen to allow the summer heat to escape up through the vents.

Most screen materials are plastic. In a fire these materials can support combustion and increase the intensity of the fire. Materials selected should either have a fire break installed or be fire-retardant.

The fire break is a section of fire-retardant material on both edges of a screen panel. It limits the flame to travel.

Some building inspectors require the screens to be made of fire-retardant material when used in garden centers and greenhouses open to the public. Along with this the support cables should be made of stainless steel instead of the more common monofilament.

Installation and maintenance

A screen system is easiest to install if a greenhouse is empty of plants. Man-lifts are frequently used to elevate workers to the truss level and require space to maneuver.

Heat supply pipes that are above the screen have to be insulated or moved lower. Vent arms, water pipes, light fixtures and electrical wiring may also be in the way of the screen system. The system requires a clear area at least 12 inches high.

Closed weave energy screens need to be installed to provide a tight seal all the way around the edges. The most common method is to install a narrow ledge along the sidewall made from polycarbonate sheets or fire-resistant screen material. The side edges of the screen slide along the top of this ledge. The back edge is attached to the truss and the leading edge is attached to rigid tubing that seals the screen against the truss.

Typical temperatures that would be observed in a heated greenhouse on a cold night might be 60°F under the screen and 35°F-40°F above the screen. I have been in greenhouses where the temperature was warmer above the screen than below it demonstrating that heat was escaping through holes or gaps around the edges.

Regular screen maintenance is needed to keep the proper tension in the cable system. Pulleys and gear motors should be lubricated once or twice a year. Screen materials tend to wear at the rub points or where they are supported by hooks. Repairs may have to be made at these points.

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