

## Reducing Greenhouse Space Heating Costs Before the High Bills Come

**Scott Sanford**

*Senior Outreach Specialist*

*Wisconsin Focus on Energy / Rural Energy Issues*

*University of Wisconsin, Biological Systems Engineering*

Natural gas and propane prices have been increasing over the past few years due to increasing demand. During the winter of 2001 and earlier this year, natural gas prices spiked unexpectedly and this past summer natural gas prices were 20% higher than a year ago. Energy is the second largest cost for greenhouse owners behind labor costs, with greenhouse heating consuming 70 - 80% of the total energy budget.

Many things can be done to reduce heating costs: make sure furnaces and heaters are cleaned and adjusted to operate at maximum performance, replace older less efficient heaters with heaters that have efficiency ratings of 90% or higher, make sure the envelope of the greenhouse is tight to keep infiltration leaks at a minimum and wall off unused areas of the greenhouse to reduce the amount of heated space. These are important maintenance tasks which good greenhouse managers should already be doing. So what can I do to have a **major** impact on reducing energy costs?

Screens!!!! It's not a new technology - screens, thermal blankets, night curtains, they are called many different names and have been available for many years. I'm going to use the term "screens" because they do more than just reduce night time heat loss during cold weather. Thermal screens are fabrics that are pulled across the roof and sometimes cover the side walls inside the greenhouse to reduce heat loss during night time hours in cold weather. Screens work by reducing the volume of the heated space in a greenhouse and provide an additional thermal boundary. High efficiency thermal screens are design to reflect the infrared radiation emitted by the greenhouse structure, plants and benches back into the greenhouse. Some screens can also double as shade cloth in the summer to reduce ventilation and cooling requirements by reflecting un-needed light (heat) out of the greenhouse. There are a variety of screen materials available to meet different crop needs with night time heat loss reductions ranging from 20% to 54% and summer shading from 15% to 99.9% (blackout). Since 70% to 80% of the heating occurs during night hours, a substantial reduction in energy use can be realized. Some growers have realized heating bill savings of up to 50% with the use of thermal screens and in addition, there may be electrical savings from reduced cooling loads during the summer months if also used for shading.

Screen Materials - There are many types of screen materials on the market but the type that offers the best alternative for both heat retention and shading are nonporous films made of alternating strip of clear and aluminized polyester or acrylic fabric. The aluminized strips reflect un-needed light out of the greenhouse during summer and reflect heat back into the greenhouse at night during cold weather. Flame resistant fabrics are recommended and may be required. Check with your building inspector to determine local code requirements. Porous fabrics with gaps or open weaves for air circulation have some value for heat retention but are principally used only for shading.

Installation - Screens can be installed in almost any greenhouse but some modifications may be required. If plants, lights, heat pipes, air ducts or irrigation lines are hanging from the roof structure, they may need to be moved or supported from the ground before screens can be installed. The mechanical system to move the curtain easily is usually the most expensive part of a screen system but can also be very simple as well. In a free-standing greenhouse the system may consist of three tracks (one on each side and one in the center of the greenhouse), trolleys or rollers that ride in the track with clips to attach the blanket to the trolleys. A simple system can be opened and closed by hand or can be fully automated to open and close based on outside temperature and amount of solar radiation available. All edges of the screens need to be sealed when closed to prevent a chimney effect where warm air rises above the screen and displaces cold air. Such an effect can cause localized crop damage as the cold air falls to the floor.

The National Greenhouse Manufacturers Association publication, "Considerations for Internal and External Greenhouse Curtain Systems" ([www.ngma.com/standardpdf/curtainssystems.pdf](http://www.ngma.com/standardpdf/curtainssystems.pdf)), goes into more depth about the different system configurations for curtain systems than I have room to explain in this article. Another must publication for every greenhouse grower is "Energy Conservation for Commercial Greenhouses", published by NRAES ([www.nraes.org](http://www.nraes.org)). You should be able to save a hundred times the \$17 cost of this publication from the ideas it presents. The University of Wisconsin extension web site on natural gas and nitrogen fertilizer price increases has additional energy saving tips ([www.uwex.edu/ces/ag/issues/naturalgas/index.html](http://www.uwex.edu/ces/ag/issues/naturalgas/index.html)).

Screen systems and fabrics are available from a number of suppliers; check with your local greenhouse equipment supplier, trade magazines or refer to the National Greenhouse Manufacturers Association ([www.ngma.com](http://www.ngma.com)) for a list of members and the products they supply. When installed and used correctly, thermal/shade screens can improve plant growth and reduce both heating and cooling costs with paybacks of 2 to 3 years for an average greenhouse.

Wisconsin has a grant program, called Focus on Energy, to aid in the adoption of energy saving technologies like thermal/shade screens. The program offers free independent energy audits to agricultural enterprises whose utility is a participant in the program. Call 1-800-762-7077 or go to [www.focusonenergy.com](http://www.focusonenergy.com) for more information.