

Dramatic Energy Savings Possible for Greenhouse Operators

Researchers at Cornell University have put together an energy conservation system that will cut costs of fuels dramatically for greenhouse operations while maximizing the use of solar energy.

Now ready for adoption by the industry, the Cornell system is capable of reducing at least 60 percent of the heating needs for the typical commercial greenhouse.

With other steps now undergoing extensive testing, the savings could go even higher, as high as 70 percent or more. That translates into annual savings of from \$28,000 to \$40,000 per acre in fuel costs, according to Cornell researcher Louis D. Albright. The system can pay for itself within two to three years, depending on the type of fuel used, he said.

Albright is a professor of agricultural engineering in the NYS College of Agriculture and Life Sciences at Cornell and leader of a research team conducting a passive solar energy greenhouse project.

Underway since the mid 1970's, on the heels of the Arab oil embargo, the Cornell project is being carried out in collaboration with Robert W. Langhans, professor of floriculture, an expert on greenhouse management. Other researchers involved in the project are Anthony Donohoe, design engineer, and Lori Marsh, research support specialist, both in Cornell's Department of Agricultural Engineering.

When the energy crunch first hit the nation nearly a decade ago, the greenhouse industry was one of the first to feel the pinch. Today, heating bills per acre of greenhouse space run between \$40,000 and \$80,000, depending on the type of fuel used, compared to \$10,000 before the energy crisis.

With an estimated 10,000 acres under glass throughout the United States, the annual fuel cost is enormous.

New York State, one of the nation's leading producers of greenhouse crops, has approximately 500 acres of greenhouse space. With the new system, potential savings in energy costs in New York alone could range from 14 million to 20 million annually. The heating season here and in other parts of the country under similar climatic conditions runs from late August to late May.

Most of the savings achieved by the Cornell system come from the use of a unique insulation cover drawn over greenhouse plants at night. Tested successfully under commercial conditions in Elmira, New York, the thermal curtain as it is called reduces nighttime requirements by at least 85 percent.

Nighttime heating accounts for about 70 percent of the total amount of fuel used daily in a greenhouse, thus an 85 percent savings means a 60 percent reduction in consumption, Albright pointed out in a recent interview.

The night cover consists of five layers of foil-covered cloth, with air spaces between them when deployed. It has an insulation "R" value of 8 to 9, equalling a two- to three-inch fiberglass batt in insulation value.

The curtain is stretched over and around the plants along the entire length of a greenhouse, thus preventing heat from escaping through the roof and walls. This setup looks something like a mosquito netting over a cot used on a camping trip. During the day, the cover is rolled up like a window shade.

The Cornell researchers hope to save even more energy with other innovative conservation steps. Now under test is a light level controller designed to operate the thermal curtain based on how much light is available for plant growth.

If light levels are too low for plants, especially when days are cloudy and dark in mid-winter, the automatic controller will close the night cover, because heat loss resulting from opening the cover could cost more than the lack of plant growth through inadequate photosynthesis.

"This device we are testing is sophisticated", Albright said. Preliminary results have shown that the light level controller can lead to an additional ten percent savings in overall heating costs.

Cornell researchers also see the possibility of attaining even greater energy savings in other ways. For example, they are testing the idea of letting the greenhouse cool down during the night as nature dictates. In commercial greenhouses, night temperatures are kept at prescribed levels for different crops.

In tests with lettuce and chrysanthemums, Cornell researchers found that letting the temperature slide down during the night does not affect plant growth and quality.

This practice could minimize late night heating requirements even further Albright pointed out.

Also under study is the idea of letting the greenhouse temperature go up gradually during morning hours rather than bringing the temperature back up abruptly. This could lead to additional energy savings, if plants respond well to gradual rise in temperature. Daytime heating makes up about 20 to 30 percent of total fuel use.

To make the operation of the Cornell system and related conservation measures simple and effective, Cornell researchers are using a computer-based control system to maintain the best possible environmental conditions for crop production.

Accurate control of temperatures, among other factors crucial for greenhouse crop production, can result in a more efficient use of solar energy, leading to additional savings in fuel costs Albright noted. Eventually growers may have to rely on a microprocessor-based control system which is now becoming available commercially.

Discussing the possibility of using Cornell's night cover concept for other purposes, Albright said that a modified night blanket can be used to save energy for atriums of large shopping malls and other kinds of buildings with large glass window areas.

Laverack & Haines, Inc.

135 Delaware Avenue, Buffalo, N.Y. 14202

Executive Park East 890 Seventh North Street
Albany, N.Y. 12203 Liverpool, N.Y. 13088

529 Fifth Avenue, New York, N.Y. 10017

Managers of

WORKMEN'S COMPENSATION GROUP NO. 453
of The State Insurance Fund

Sponsored by the

NEW YORK STATE FLOWER INDUSTRIES, INC.

This program provides the members with a substantial savings in their Workers' Compensation cost.