Greenhouse energy may be conserved

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NEWARK, Del. - Commercial nurserymen and homeowners with hobby greenhouses are both faced with a critical problem today - the conservation of energy in greenhouse operation. The best way to do this is with better insulation, says Dr. David Mears, an agricultural engineer at Rutgers University who has been working for several years on ways to solve the problem. He has developed some simple techniques which can cut fuel consumption in the average greenhouse by as much as one half.

Mears talked about some of these techniques recently, during the Delaware Nurserymen's Short Course in Dover, Del. This is an annual event sponsored jointly by the Delaware Cooperative Extension Service and the Delaware Association of Nurserymen.

He told his audience there that it's irrelevant to talk about how much longer fossil fuel supplies are going to last. "The fact is, these are limited and running out. Whether it's a matter of five years or fifty, we'd better get crackin' on some answers."

The engineer and his colleagues at Rutgers have been tackling the knotty problem of energy conservation in greenhouses from two directions: improved insulation to cut heat loss, and improved heat sources, including the use of solar energy.

By far the easiest way to save energy in a greenhouse is to find a way to cut heat loss, he explains. Insulation isn't as glamorous a subject as solar energy or nuclear power plants or windmills, but it's far more practical. This is largely because greenhouses are notoriously poor in design from this standpoint.

In one of their first efforts at improving insulation, the Rutgers team came up with a procedure which they say can reduce fuel oil consumption by 33 per cent. The idea is simple - you just take two sheets of polyethylene, seal them together, blow air inside and use this "pillow" to cover your greenhouse frame. For every 100 units of fuel oil you'd burn in a fairly tight single covered house, you'll use only about 67 with this treatment, states Mears. This is because of the insulating effect of the dead air space between the sheets of plastic. The idea is adaptable to many types of greenhouse and is currently being used by one commercial nursery operation in central New Jersey on a structure that covers six acres.

Another insulation treatment being studied is the use of curtains which can be raised at night inside the greenhouse. The material used doesn't matter - clear polyethylene, black polyethylene, aluminized mylar, fabric or something else. What is important is the dead air space that's created. When Mears and his colleagues installed such curtains inside a greenhouse with the plastic pillow treatment, they were able to further reduce fuel consumption to half of what it would have been in a conventional house.

Greenhouse operators can also economize on fuel by improving the method of heat distribution in their buildings. The Rutgers team is now working on an experimental design where heat is provided by warm water under the floor of a house insulated in the ways described above. This water can be heated either by conventional fuel or by solar means.

The idea is to spread a vinyl swimming pool liner over a three-quarter inch cushion of slab styrofoam and partially fill this liner with crushed rock. This is then capped with a layer of porous concrete to provide a surface to walk on. Warm (75-80 degrees F.) water is then circulated through the crushed rock. The result is equivalent to having a large, warm lake under the floor of the house. The entire installation costs about 80 cents a square foot, says Mears, and it distributes heat much more evenly than systems where water pipes are buried under regular concrete.

In the prototype design being developed at Rutgers, the water for this heating system is warmed most of the time by a nearby solar collector which stores heat on sunny days. An oil burner provides backup heat for cloudy weather when not enough solar heat is collected. The collector used is a simple one built of wood and plastic for about $1 a square foot. Though not as efficient as more expensive commercial types, the unit provides adequate heat for the needs of the greenhouse.

A further refinement of the heating system is to introduce what might best be referred to as a temporary "warming wall" inside the greenhouse. To do this, a clothesline is strung across an aisle. A piece of perforated plastic tubing is attached to this and a large sheet of plastic is then draped over the line so that it hangs down to the floor on both sides. Warm water is next pumped through the perforated tubing. This runs down inside the plastic sheet and drains through the porous concrete floor back into the water stored there.

The effect is to warm the air space around the plastic "wall" to the same temperature as the water flowing inside, without saturating the atmosphere of the house with humidity, as would happen were the warm water to be simply sprayed into the air. When the warmer is not needed, the clothesline is simply lowered to the floor.

Some of the devices being developed by Mears and his associates to reduce fuel consumption may remind the reader of the once-famous inventions of Rube Goldberg. But the fact is, these ideas really work.

Between September 1 and January 3, using all the above procedures and in spite of extremely low temperatures and a record number of degree days, the researchers succeeded in heating their experimental greenhouse with about one-fifth the fossil fuel they would have had to use in a conventional, single glazed structure of the same size.

Lest commercial nurserymen and home greenhouse buffs think that all these energy saving ideas must wait for some future application, along with the solar energy, it is well to remember Mear's initial point - that half of their overall fuel savings resulted from insulation improvements alone. Solar energy may someday become the routine fuel in greenhouse operations, but for the present there's a big savings to be made just by locking in the heat, no matter what its source.