

Novel Approaches to Improve Energy Efficiency in Northern New England Greenhouses

Summary of Results September 2014

Bruce L. Parker, Margaret Skinner, Donald Tobi,
Cheryl F. Sullivan & Peter N. Skinner

University of Vermont Entomology Research Laboratory
661 Spear Street, Burlington, VT 05405
www.uvm.edu/entlab/



Experimental greenhouses

Objective: Determine the energy use of two greenhouse insulation technologies (a bubble insulation system and an energy/shade screen) retrofitted into plastic covered greenhouses, and compare the conservation of these systems to a standard double-layered inflated plastic greenhouse.

What did we compare?

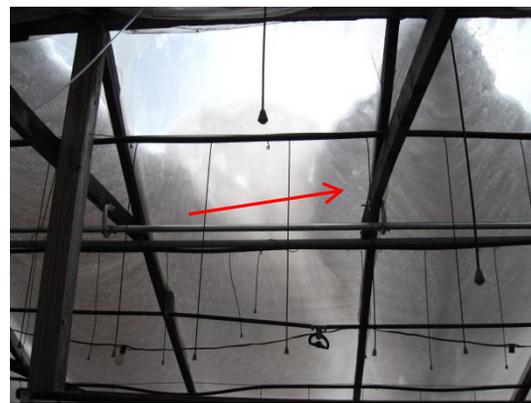
The three experimental greenhouses (25 ft wide, 88 ft long; 2,200 sq ft) are identical wood-frame gable structures.

1. Unimproved standard double-layer poly inflated greenhouse (control)
2. Bubble insulation injected between two plastic layers
3. Thermal energy curtain

The R-value of a typical plastic house is around 1-2, compared to an estimated 30 for the bubble system.

What did we learn?

The bubble insulation system and energy curtain provided significant reductions in natural gas use and associated heating costs compared to the unimproved house. The bubble insulation system was more energy efficient than the other two, but required more ongoing maintenance to keep it operational.



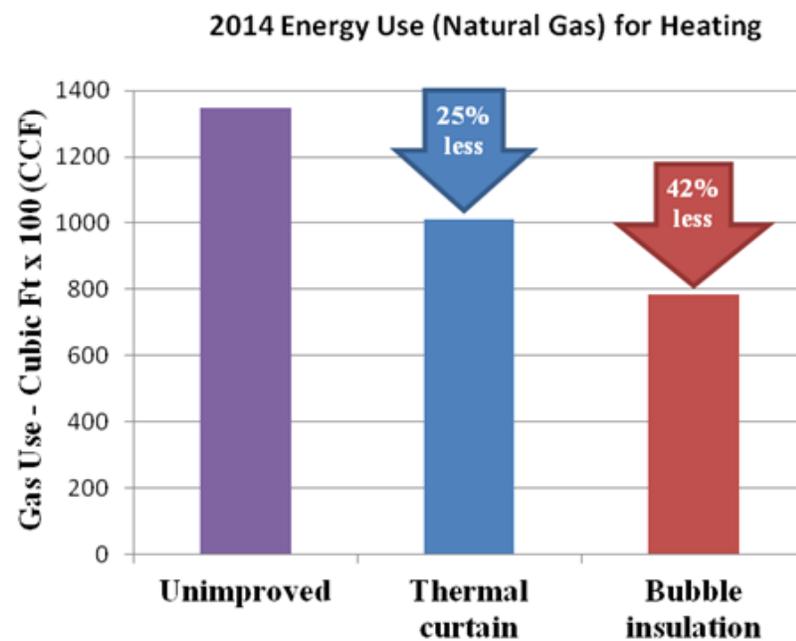
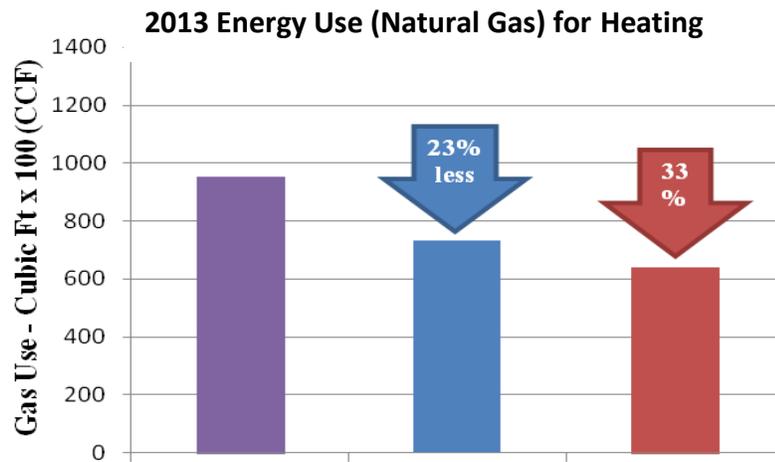
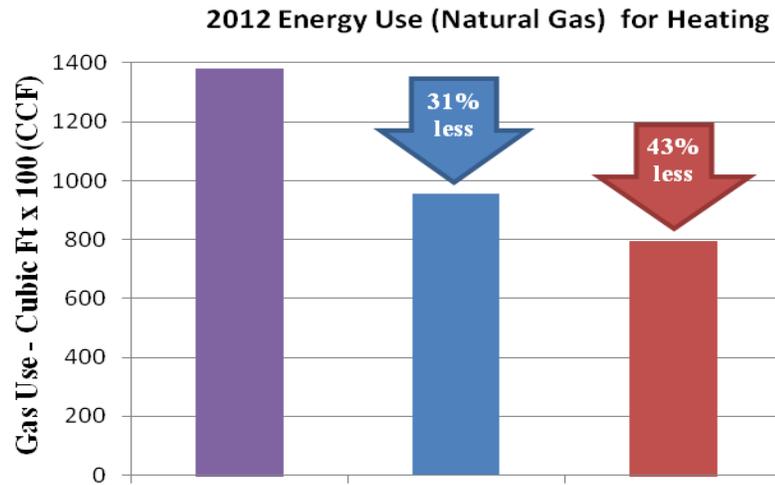
Left: Energy curtain (red arrow). Right: Soap bubble system in operation (red arrow indicates soap bubbles being generated)

What are the savings?

Savings in Natural Gas Use:

- Soap bubble system
 - 2012: 43% less gas and \$946.00 lower cost than control
 - 2013: 33% less gas and \$727.00 lower cost than control
 - 2014: 42% less gas and \$1310.00 lower cost than control
- Thermal energy curtain
 - 2012: 31% less gas and \$682.00 lower cost than control
 - 2013: 23% less gas and \$593.00 lower cost than control
 - 2014: 25% less gas and \$780.00 lower cost than control

These data are for natural gas. Propane users would see roughly four times the savings as those stated above and fuel oil users would see roughly twice the savings stated above.



Natural gas use in experimental greenhouses during the research trial period, 2012-14.

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