

# Novel Approaches to Improve Energy Efficiency in Northern New England Greenhouses

## Summary of Results July 2013

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**Objective:** Determine the energy usage 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 novel systems to a standard double-layered inflated plastic greenhouse.

### What are we comparing?

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

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

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

### What have we found?

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

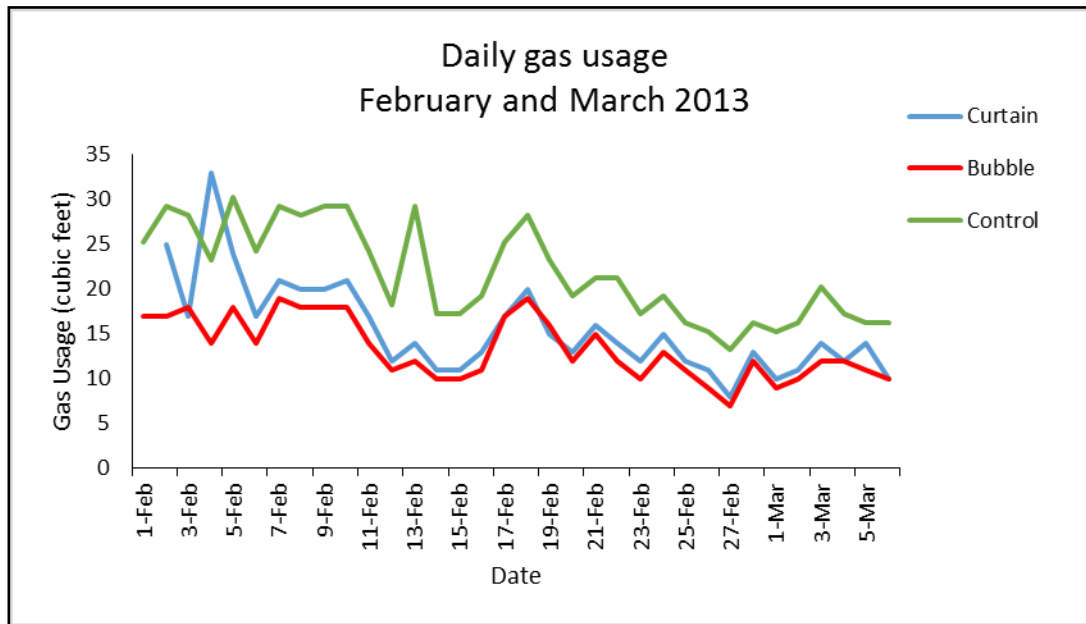
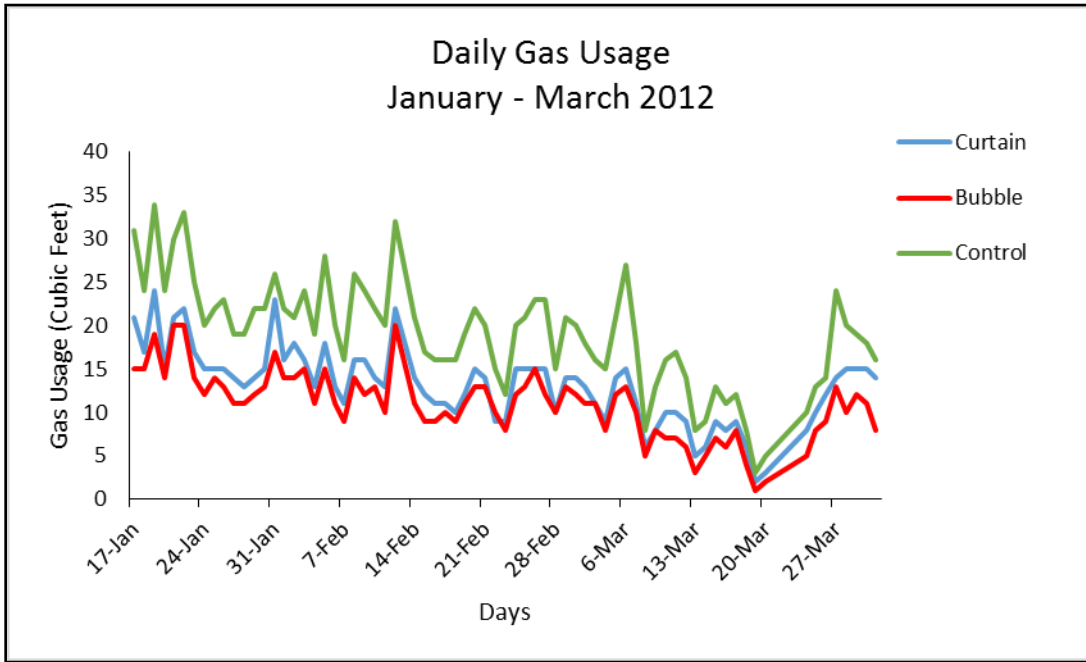
### What are the costs and savings?

- **Costs:**
  - Initial purchase and installation
    - Soap bubble system: \$34,800<sup>1</sup>
    - Thermal energy curtain system: \$10,800
- **Savings:**
  - Natural gas usage:
    - Soap bubble system
      - 2012: 43% less gas and \$946.00 lower cost than control
      - 2013: 38% less gas and \$727.00 lower cost than control
    - Thermal energy curtain
      - 2012: 31% less gas and \$682.00 lower cost than control
      - 2013: 31% less gas and \$593.00 lower cost than control

**Note:** 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.

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<sup>1</sup> This cost should be lower if the product was mass produced and commercially available.



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