

Novel Approaches to Improve Energy Efficiency in Northern New England Greenhouses

Images showing Adjustments made to the Test Greenhouses and Data Collected in 2012



Fig. 1. Replacing plastic on bubble system greenhouse; Canadian expert installing splines (left); UVM and Claussen employees rolling out plastic (right).



Fig. 2. Hayward valve that failed due to high heat.



Fig. 3. Device for preventing fluid pooling at the edge of the greenhouse (left to right); black tube attached to hip frame of greenhouse, EPDM plastic covering tube; pooling of the soap solution that continued to occur.



Fig. 4. Black tubing placed vertically between the two layers of plastic, which effectively eliminated the pooling problem.

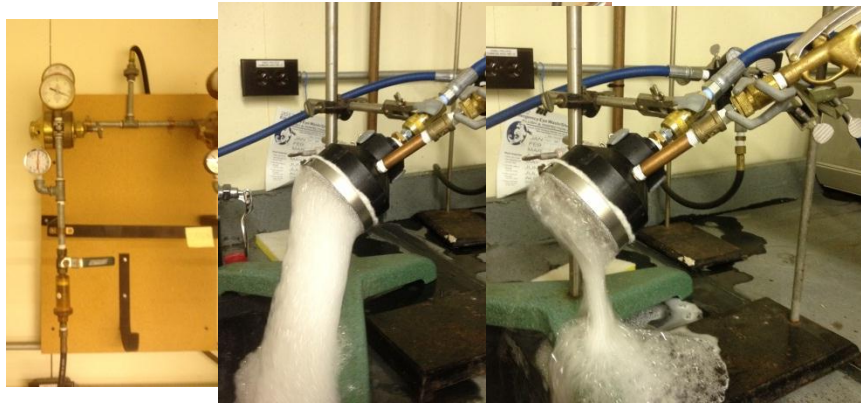


Fig. 5. Apparatus to test the quality of soap bubbles at different Carbowax concentrations (left to right), gauges allowing us to control pressure; good quality bubbles produced with a 2% soap and 10% Carbowax solution; poor quality bubbles produced with a 2% soap and 40% Carbowax solution.



Fig. 6. Digital systems installed for automatic operation of the curtain and furnaces.

Table 1. Cost of gas used in the three demonstration greenhouses

Total cost of gas used each month in each greenhouse			
Month	Curtain House	Bubble House	Control House
January (1/17/12 – 1/31/12)	\$389.31	\$331.05	\$511.02
February 2012	\$554.14	\$490.69	\$789.79
March 2012	\$404.70	\$329.60	\$571.73
Total	\$1,348.14	\$1,151.34	\$1,872.54

Table 2. Comparison of dollar savings from gas use in the three demonstration greenhouses

Dollars saved in gas usage each among the greenhouses			
Month	Bubble vs Curtain House	Bubble vs Control House	Curtain vs Control House
January (1/17/12 – 1/31/12)	\$54.38	\$200.69	\$146.31
February 2012	\$63.45	\$299.10	\$235.65
March 2012	\$75.10	\$242.13	\$167.03
Total	\$192.93	\$741.92	\$549.00

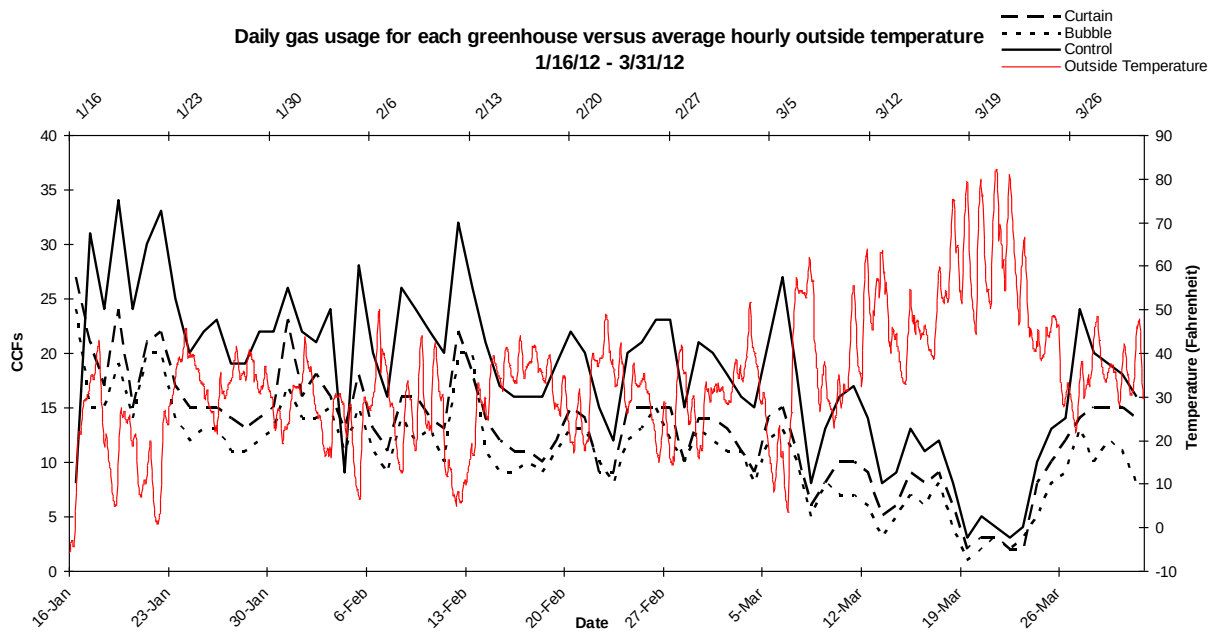


Fig. 7. Gas use and ambient temperature in the three demonstration houses.



Fig. 8. Some of the visitors to the greenhouse test site in 2012; A) John Bartok, greenhouse energy engineer; B) members of the Northeast Horticulture Inspection Society and VT Department of Agriculture personnel.