

Storing Your Crops

Tips and Tools for Success

Vermont Vegetable and Berry Growers Association

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Outline

- What We Are Doing – Survey Results
- Top 5 Best Practices & Resources
- Current Research & Projects
- Q&A, Feedback

Survey Results

- Existing Storage
 - Walkin cooler (57%)
 - Chest freezers (55%)
 - Heated Winter Storage (39%)
 - Root Cellar /
Other Cool Storage (not refrig'd)
(31%)
 - CoolBot(TM) (28%)
 - Walkin freezer (16%)
 - Other cooler refrigerated (16%)



Survey Results

- **82%** interested in a **formal course** on food storage
- **66%** of respondents **have plans to expand** food storage capacity in the next 24 months.
- Most respondents expressed **concern about the utility costs** of their storage systems, **relatively few (37%)** currently **know those costs**.
- **60%** are storing in **multiple zones** (Temp and RH)
- Winter Marketing:
 - Wholesale (74%)
 - Retail (41%)
 - Farmer's Markets (41%)
 - Winter CSA (38%)

Survey Results - Lessons

- **Get field heat out** quickly and keep it cold
- **Excellent storage** is key to having **excellent product**
- **Measurement** of temperature (and RH) is critical, **don't assume** you are hitting your target conditions
- Watch out for **ethylene** off-gas from, e.g., apples (not just apples!)
- Climate change is impacting **harvest timing** and therefore marketability and storage needs
- Plan for **power loss & insure** your product for loss while in storage
- **Build bigger** than what you presently need. Coolers and freezers are quickly outgrown. **Insulate, insulate, and then insulate some more.**
- Consider “**keeping it on the hoof**” instead of harvest and storage.
- **Pre-sell** – grow only what you know you can sell – Sales and product movement are critical. Do the pre-planning.

Top 5 Best Practices & Resources

- Zoned Storage (Temp and RH Zones)
- Measure and Monitor
- Scouting
- Cooler Audit
- Technical References

Zoned Storage

- Zoned by temperature and relative humidity
- Also consider ethylene production and sensitivity
- Low cost – vapor barrier walls
- Higher cost – dedicated structures
- Could also be useful to have a zone dedicated to precooling / removal of field heat.

Measure and Monitor

- “The measured variable improves.”
- Temperature **AND** Relative Humidity
- Don’t assume you have the conditions you want. **Measure.**
- **Low tech** – wall sensors, daily checks, log book
- **High tech** – remote monitoring email alerts
- Calibration and certification

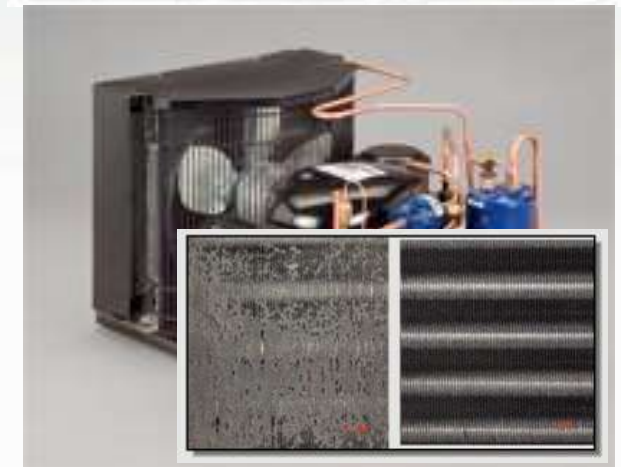


Scouting

- Daily checks for spoilage, sprouting
- Have different people perform the task
- When pulling stored crops, check other bins
- Check for spoilage, sprouting
- Use all five senses
- “Scout” the mechanicals also

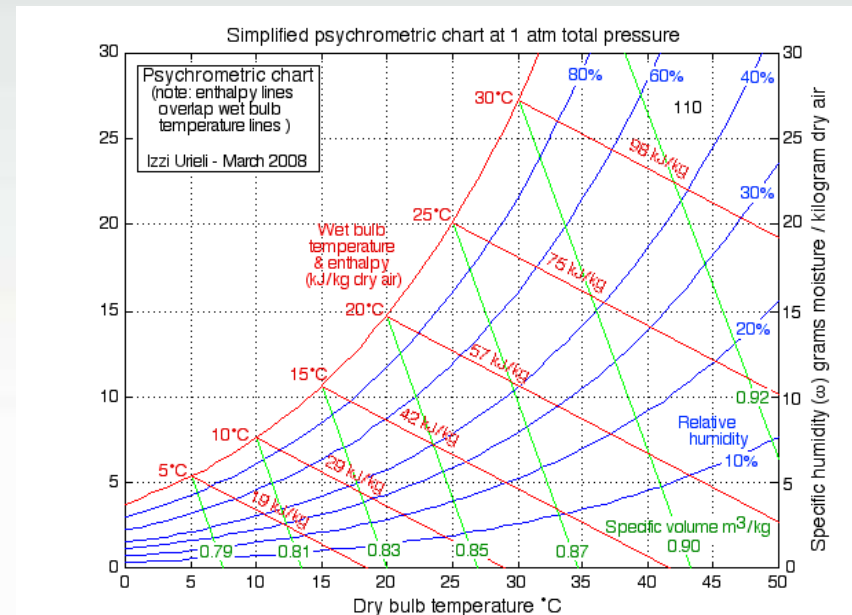
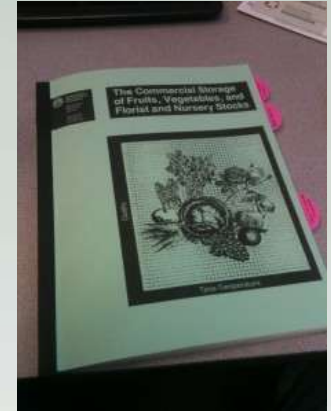
Cooler Audit

- Envelope (“The Box”)
 - All doors close tightly
 - All seals are sealing
 - Signs of degradation
 - Signs of mold
 - Air circulation inside
- Mechanicals (“The Chiller”)
 - Noise is energy
 - Condenser coil is clean and clear
 - Annual refrigeration tuning



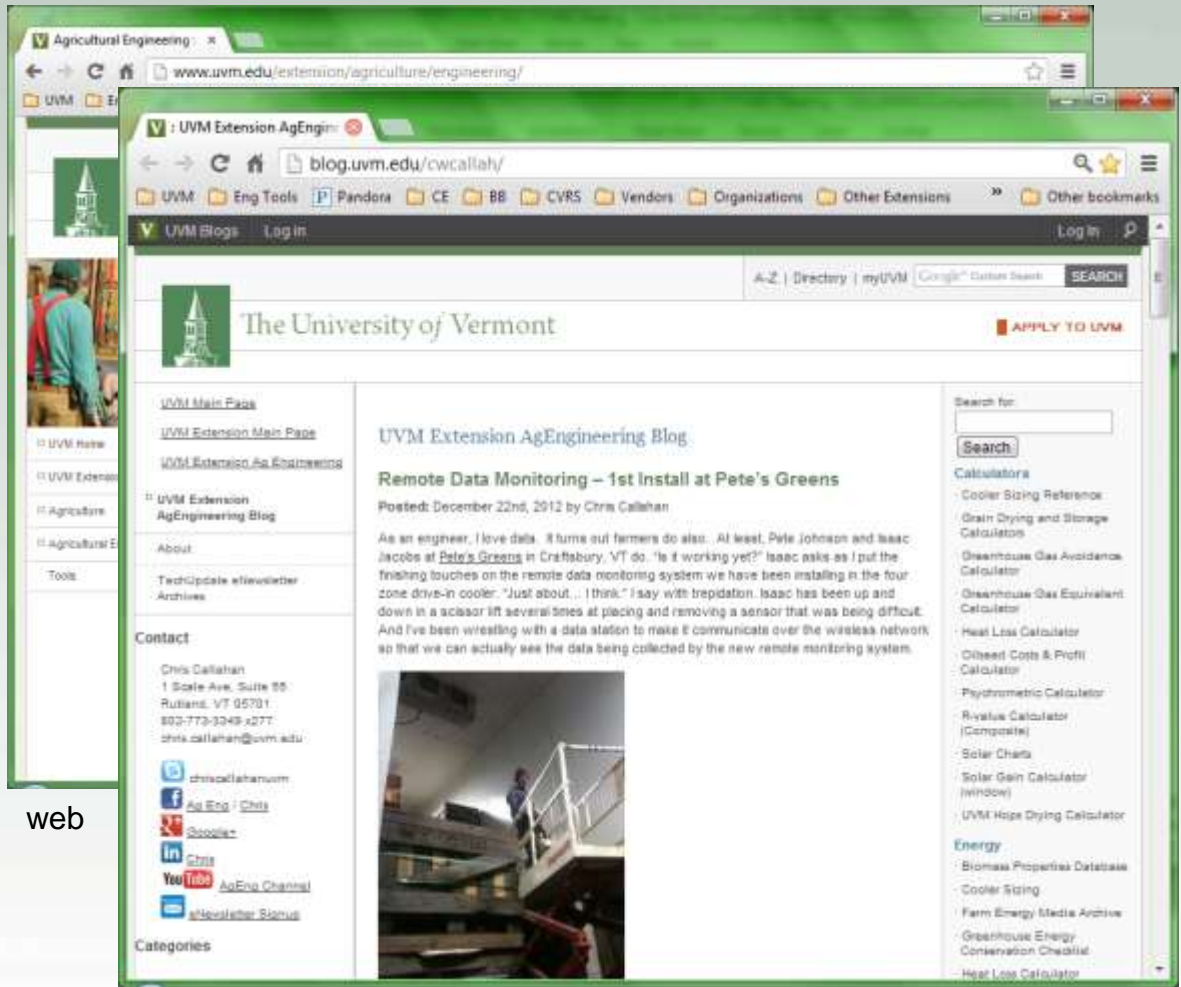
Technical References

- USDA HB 66
- NE Veg Guide
- UC Davis Post Harvest Website
postharvest.ucdavis.edu
- Psychrometric Charts and Calculators



Current Research and Projects

- Structural & Energy
 - Best practices for sealing and insulating, and for food safety. Improvements for energy efficiency.
- Quality
 - Measurement and monitoring of conditions. Alternative evaporator designs better suited for unpackaged produce. Outside air exchange concepts.
- Farmer Storage Course
 - Farmer oriented class on food storage practices.
- Storage Planner
 - User selects crops and expected yields, planner estimates storage volume and conditions required , groups crops for storage, estimates space and cooler sizing.



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