Greenhouse Competitiveness & Innovation Initiative - Dehumidification

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Rationale

Energy savings, through a reduction in fossil fuel consumption, can be realized by using dehumidification systems to control indoor relative humidity.

Dehumidification Systems

LDD

- chemical desiccant
- effective except in summer

MRD

- mechanical refrigeration
- effective except in summer

HRV

- air-to-air heat exchange
- effective in moderately cool and dry seasons

ERV

- combination of chemical and air heat exchanger
- effective year-round
- prototype system

Key Findings

Energy Savings Potential: goal to minimize fossil fuel consumption

- Energy consumption lower compared to traditional ventilation in shoulder and winter seasons (at least 10%, potentially much more)
- Relative cost of energy dictates the cost-effectiveness of each system
- Technologies need to be integrated properly with the control system logic to achieve optimal savings
- Size the unit(s) appropriately to achieve optimal energy savings

RH Control: goal to keep RH within a 'set' range

- Dehumidification systems are often better at controlling relative humidity (RH) than ventiing
- When RH is a concern for crop health & disease management, dehumidification is an excellent tool
- Crops with high transpiration rates (and higher irrigation levels) benefit from dehumidification

Microbial air quality: goal to decrease disease pressure

- Dehumidifcation (mechanical or ventilation) is essential to avoid high populations of air-borne pathogens
- LDD was marginally more effective at managing air-borne fungal populations, but the project indicated that regular cleaning of the units might be required where closed, recirculating air systems are used

How to Choose if a Dehumidification System is Right for Your Farm

- #1 – investigate several technologies and expect in-depth interviews with reputable suppliers
- Consider greenhouse configuration, energy sources/layout, production requirements, control system, climate
- Generally, energy savings can be realized using dehumidification in temperate climates, but results vary. Without monitoring equipment, actual savings can only be based on year-over-year energy consumption differences.
- Refer to the full GCII-17 technical report for detailed information

	Energy					Crop Considerations			Specifications	
Dehumidification System	Uses Electricity	Uses Natural Gas	Produces Latent Heat	Requires Heat (Regeneration)	Energy Savings?	Cold Crops	Warm Crops	Manages Humidity?	CFM[1]	Max moisture removal capacity[1] (L/h)
HRV	✓				?	✓		?	7200	Varies[2]
MRD	✓		✓		✓		✓	✓	12950	45
LDD	✓	✓	✓	✓	✓		✓	✓	6356	20
ERV (HRV+LDD prototype)	✓	✓	✓	✓	✓	✓	✓	✓	4500	Varies[2]/20

1. Units tested in this project; 2. Depends on outdoor conditions

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