

Refrigerated Conditions in Storing Florida Citrus

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Modern Cold Storage

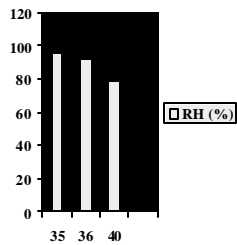


Florida Refrigerated Storages - Temperature & Relative Humidity Conditions

Facility	Avg.Temp	Temp. Range	Avg. RH	RH Range
A	8.5 +/- 1.7	4.2 - 14.1	80.0 +/- 8.2	31.5 - 95.3
A2	7.7 +/- 0.7	5.0 - 9.8	82.7 +/- 3.8	72.5 - 92.9
B	3.7 +/- 0.8	2.5 - 4.2	91.4 +/- 1.5	85.4 - 95.7
B2	4.0 +/- 0.9	0.3 - 8.6	87.3 +/- 2.4	83.6 - 98.5
C	9.1 +/- 0.5	7.0 - 10.0	90.5 +/- 4.5	74.2 - 97.2
D	12.5 +/- 1.2	8.2 - 16.0	87.8 +/- 5.0	68.6 - 95.0
E	9.3 +/- 0.3	8.6 - 10.2	82.5 +/- 3.9	69.7 - 93.8
F	10.9 +/- 1.5	6.6 - 14.5	90.5 +/- 7.7	71.6 - 99.3
F2	6.1 +/- 2.2	1.6 - 10.6	91.7 +/- 6.1	77.8 - 99.3
G	3.7 +/- 0.9	2.0 - 8.2	85.3 +/- 2.7	79.4 - 96.0

Temperature/ RH Profile

- 35 deg-F (db)
- 36 deg-F (db)
- 40 deg-F (db)
- ~ 3 % RH per deg-F



Precooling Chamber



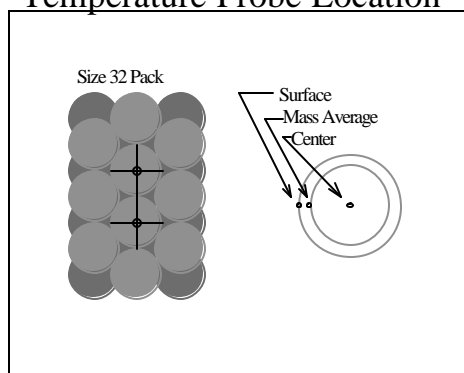
- 4 cartons/layer
- 1,2,3 layer depth
- Fan, > 2 in. static pressure

Temperature Sensing

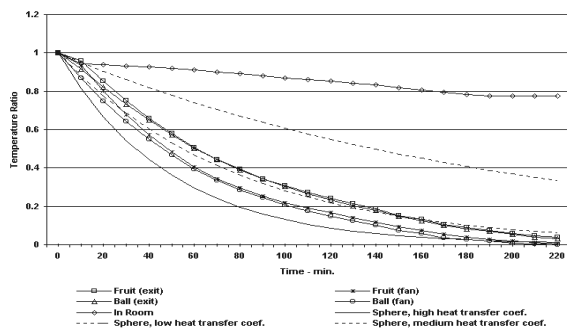


- Location- within load
- Location- within carton
- Location- within fruit

Temperature Probe Location



Cooling Curve



Center Position-Half-Cooling Time

<u>Configuration</u>	<u>Time, min</u>
Single Layer	60
Dual Layer (vent matched)	130
Dual Layer (vent not matched)	350
Room (single carton)	437
Stacked pallet (inside position)	990

Carton Venting, Area & Alignment



- Situation- natural convection (room) or forced-air
- Matching of vent openings is critical

Refrigerated storage in pallet bins



Grapefruit Pitting Incidence

<u>Treatment</u>	<u>Test #1</u> <u>7deg-C</u>	<u>Test #1</u> <u>20 deg-C</u>	<u>Test #2</u> <u>7 deg-C</u>	<u>Test #2</u> <u>20 deg-C</u>
Carnauba	0 %	0 %	0 %	0 %
Polyethylene	0	7.7	0	0
Shellac	0	27.5	0	4.0
No Wax	0	0	0	0

Moisture Loss, 4-week @ 3 Deg-C and 96 % RH

<u>Wax Treatment</u>	<u>Cooling Method</u>	<u>Weight loss, %</u>
Shellac	Natural	2.36 a
None	Natural	2.34 a
None	Forced-air	2.19 b
Polyethylene	Natural	1.99 c
Carnauba	Natural	1.95 cd
Shellac	Forced-air	1.90 cd
Polyethylene	Forced-air	1.85 d
Carnauba	Forced-air	1.68 e

Future Studies

- Optimal temperature for variety, duration of storage, mixed variety storage
- Determination of time lapse effect before initial cooling and interaction with treatments
- Expediting cooling in conventional room cooling situation