



ATMOSphere America 2013 Industrial Refrigeration Panel

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Campbell Manufacturing Facilities

- **Thermal Processing**
- **Bakeries**
- **Vegetable Processing**



Products

- **Thermal Processing**
 - Soups, Sauces, Juices, Dressings, Meals
- **Bakeries**
 - Breads, Cookies, Crackers, Baked Snacks, Frozen
- **Vegetable Processing**
 - Retail Carrots, Ingredients



Thermal Processing



Bakeries



Milano[®]
Cookies



Cracker
Favorites



Bagel Flats
Plain

Delicious Bagel Flats are low fat, have 100 calories and 5g of fiber per serving.



Texas Toast



Stone Baked
Artisan Dinner Rolls



Vegetable Processing



Refrigeration Requirements

- **Ingredient Cold Storage**
- **Process Cooling/Freezing**
- **Space Cooling**
- **Finished Goods Cold Storage**



Refrigeration Systems

- **Thermal & Vegetable Plants**

- Predominately central, both direct and indirect. Some unitary.

- **Bakeries**

- Predominately unitary. A few central, mostly direct.

- **Capacity Range**

- 300 to 6000TR (combined temperature levels)



Refrigerants

- **Thermal & Vegetable Plants**
 - Majority NH₃ and secondary refrigerants, some HCFC's & HFC's.
- **Bakeries**
 - 95% HCFC-22, some NH₃ & HFC's.

Pepperidge Farm

- **R-22 Conversion Program**
 - Started in 2010.
 - 7 Bakeries.



Background

- **Montreal Protocol**
- **High GWP for HFC's**
- **Consumer Goods Forum**
- **ABA Agreement**
- **Energy Considerations**
- **Maintenance Considerations**
- **Little NH3 Experience/Comfort Level**



Options

- **Do nothing – replace whatever as equipment requires replacement.**
- **HFC's**
- **NH3**
- **NH3/Secondary Refrigerants**
- **NH3/Secondary Refrigerants/CO2**

NH3/Glycol Recommendation

- **Packaged low charge NH3/Glycol HVAC Chillers**
- **Packaged low charge NH3/Glycol Process Chillers**
- **Low charge NH3 Freezer Packages**



Pros

- **Energy savings**
- **Maintenance savings**
- **Long term refrigerant**
- **Avoids potential HFC phase-out issues**
- **No reliance on future synthetic refrigerant uncertainties**
- **Green**



Cons

- **Safety**

- Concerns minimized thru design, training, and low charge.

- **Cost**

Conversion Status

- **4 Facilities complete**
- **Remaining 3 Facilities sequentially scheduled over the next 4 years**

Richmond Bakery Conversion

- **Before**

- Central R-22 system for blast freezer, storage freezer, portion of process cooling
- 40+ unitary R-22 units for HVAC and a portion of process cooling
- Charge – 20,000 lbs



Richmond Bakery Conversion

- **After**

- Two, 575 TR NH3/glycol HVAC chillers
- One, 400 TR NH3/glycol process chiller
- One, 250 TR NH3 freezer package
- Glycol distribution loops
- Gravity drain freezer coils
- System sized for existing HFC equipment when replacement is required
- Charge 1800 lbs

