

Sustainable Refrigeration Summit

Connecting the Pieces for
Supermarket Refrigeration Solutions



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Day 1: Monday, October 24

9AM-10AM PST

Keynote: Industry & Regulatory Trends

11AM-2PM PST

Technology Focus: Driving CO2 Performance

1PM-2PM PST

CO2 Systems: What Retailers Need to Know

Day 4: Thursday, October 27

9AM-10AM PST

Solving the Technician Shortage

11AM-12PM PST

Technology Focus: Natural Innovations

1PM-2PM PST

Reducing Refrigerant Emissions

Day 2: Tuesday, October 25

9AM-10AM PST

Distributed and Self-contained Systems

11AM-12PM PST

Technology Focus: Total Cost of Ownership

1PM-2PM PST

Measuring Performance of Natural Technologies

Day 5: Friday, October 28

9AM-10:30AM PST

State & Federal HFC Regulations

11AM-12:30AM PST

Workshop: Utility Incentives for Refrigerant GWP

Day 3: Wednesday, October 26

9AM-10AM PST

Integrating Naturals into Existing Stores

11AM-12PM PST

Technology Focus: Modular Tech. for Existing Stores

1PM-2PM PST

Funding for Naturals

Summit Program



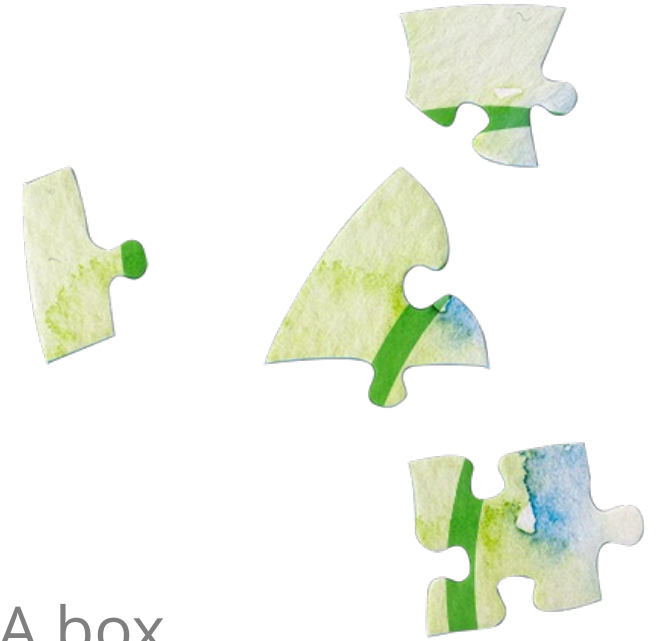
Housekeeping & Logistics

Question and Answer Session

- Participants are muted
- Questions will be moderated at the end
- To ask a question, enter your comment into the Q&A box

Need Help? Click the  button on sustainablerefrigeration.com

Missed a Session? Session recordings will be available on the platform





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CO2 Systems: What Retailers Need to Know

Monday, October 24th, 2022



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CO2 Systems: What Retailers Need to Know

Retailers share experiences & considerations for first-time adopters of CO2.



Doug Milu

Refrigeration & Energy Program Manager
Publix Super Markets



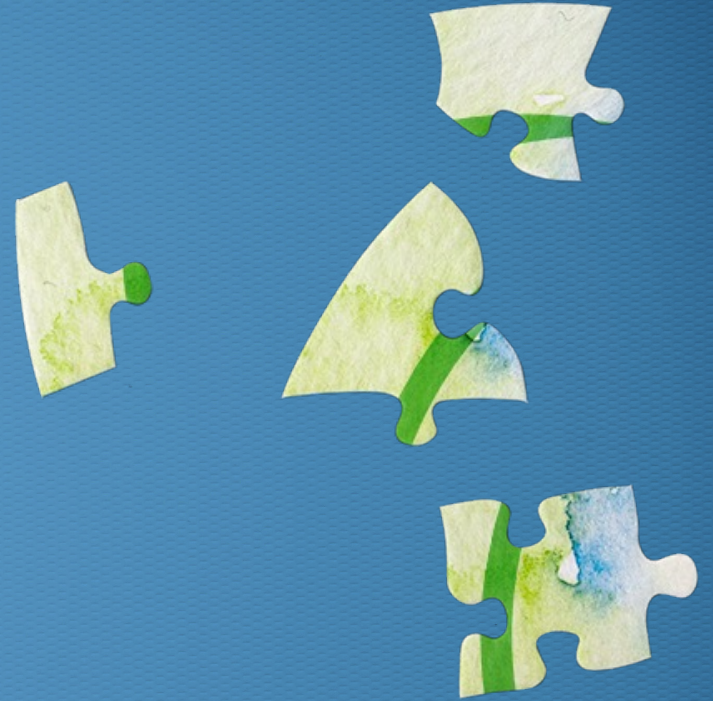
Chris Braun

Senior Project Manager-
Construction/Refrigeration/Facility Maintenance
Coborn's, Inc.



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1. Please describe your company and any relevant refrigeration or climate goals.



Publix Company Overview

- One of the largest employee-owned companies
- Over 1,300 supermarkets in 7 southeastern states
- Founding partner of EPA GreenChill program
 - 103 stores with Silver certifications, 38 stores with Gold certifications, 2 Platinum certified stores
- Strong focus to reduce refrigerant GWP
 - Current remodel program to convert stores from high-GWP refrigerants to ultra-low GWP
 - CO2 becoming standard for new stores

The Publix logo is displayed in a bold, green, sans-serif font. The letter 'P' is significantly larger than the other letters, and the 'i' has a dot. The logo is positioned in the bottom right corner of the slide.

Publix Sustainability Goals


“As one of the largest employee-owned companies with over 1300 supermarkets in 7 southeastern states, Publix associates have a huge stake in their business and the impact on the communities they serve.

As we look to a sustainable / carbon neutral future, the use of advanced refrigeration technologies incorporating CO2 (R744) aligns with the Publix Mission Statement.”



Publix

Coborn's Company Overview

- Coborn's Inc is family-owned company started in 1921
 - Percentage of the company is also an ESOP
- Operates 66 grocery stores plus Convenience, Liquor and Pharmacies
- Covers 5 states in the Midwest
 - MN, ND, SD, WI, and MI 
- Variety of store sizes varying from 25,000sqft to 105,000sqft



Coborn's Goals for Refrigeration

- Future Proof
- Service and Install Support
- Financially Viable Upfront Cost
- Total Cost of Ownership





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2. What is your
experience with CO₂
refrigeration systems?



Publix CO2 Experience

- 6 prototypes designed with CO2 as primary refrigerant
 - More to follow
- Nearly 100 stores in operation with CO2 systems
- CO2 becoming standard for new stores
- In-house training facility & CO2 training certification for technicians



Publix

Coborn's Inc CO2 Experience

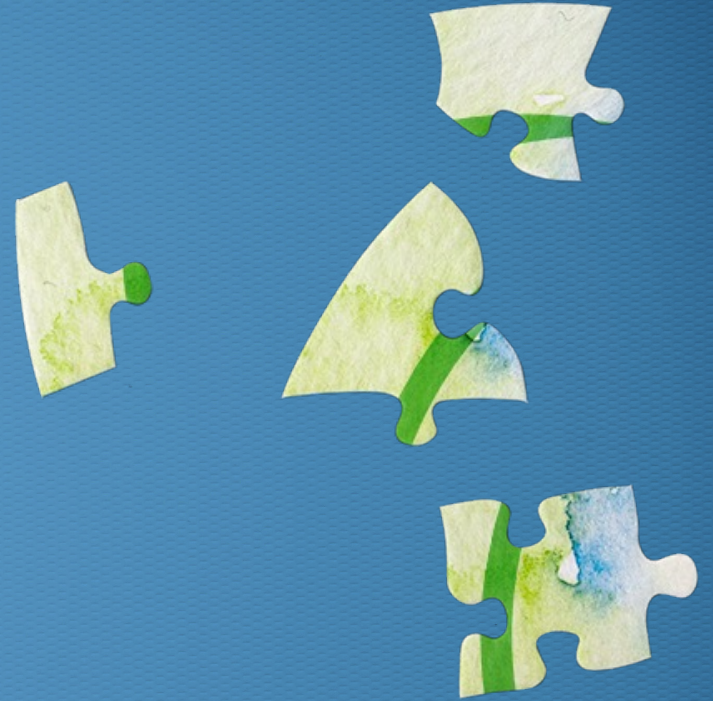
- 2 Ground up stores with CO2
- 1 Open Store Remodel
- All Sites Adiabatic Gas Coolers
- All new builds will be CO2
- Plans to remodel 2 existing stores to CO2 in 2023-24





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3. Why did you choose CO2 over other system types? What advantages stood out to you?




Publix CO2 Advantages

- Support sustainability goals to reduce GWP weighted average
- First cost of systems seem to be normalizing
- Installation and materials costs are coming down
- Energy Cost – achieving energy parity
- Future Proof
- Reduced compliance burden (EPA reporting)



Publix

Coborn's CO2 Advantages - Construction Costs

- Construction Cost reduction
 - Use CO2 to Glycol heat exchanger for vestibule in floor heat and snow melt system in lieu of natural gas boiler in winter months
 - Use Same heat exchanger for glycol to air coil to aide with dehumidification
 - Smaller loop piping
 - Smaller compressor room 
 - Save on structural steel for roof top gas cooler

Coborn's CO2 Advantages – Utility Savings

- Seeing good energy savings
- 15% average vs new store R-448
- 25% savings in remodeled store
 - Existing was circa 1982 racks and various year cases
- Water usage up average of 10% or \$200 in summer months
- Natural Gas usage down 2-3% on average





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4. What has been your experience with energy performance of your CO2 systems?



Publix Review of CO2 Energy Impact vs. HFC

PUBLIX #1668 Longwood FL CO2 Booster Performance

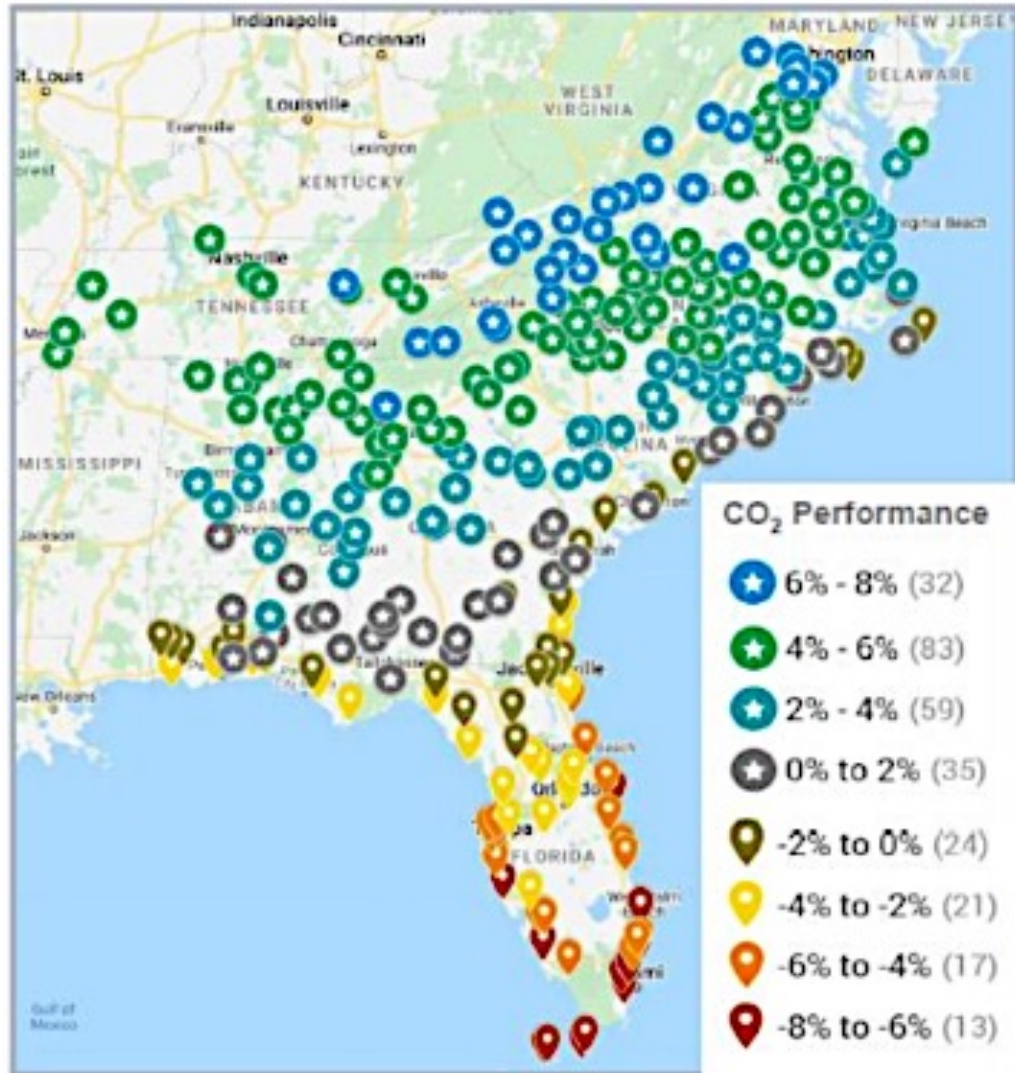
	1	2	3	4	5	6	7
Publix Store 1668 2020-2021	Refrigeration BTUs (kBtu)	Avg Suction (LT)	Avg Suction (MT)	Danfoss Power Meter Power (Comp Only) (kWh)	Calculated Power (Comp Only) (kWh)	% Difference	COP (Comp Only)
Oct 2020	247,058.44	-17.70	20.10	35,989.46	35,859.08	-0.36%	2.02
Nov 2020	235,704.04	-17.83	20.25	32,926.87	32,930.66	0.01%	2.10
Dec 2020	225,231.18	-18.48	19.50	26,152.63	26,605.39	1.73%	2.48
Jan 2021	229,109.30	-18.30	19.55	26,820.75	26,907.63	0.32%	2.50
Feb 2021	220,118.51	-17.90	19.52	26,931.16	27,035.39	0.39%	2.39
March 2021	241,958.39	-18.13	19.40	30,495.41	30,643.92	0.49%	2.31
Apr 2021	234,536.37	-17.99	18.92	30,577.65	30,709.64	0.43%	2.24
May 2021	244,493.77	-17.90	18.55	35,211.63	35,218.55	0.02%	2.03
June 2021	234,557.13	-17.82	18.01	36,998.42	37,126.50	0.35%	1.85
July 2021	240,866.12	-17.77	18.56	38,098.99	38,394.81	0.78%	1.84
Aug 2021	239,187.60	-17.00	18.92	38,129.91	38,382.49	0.66%	1.83
Sept 2021	243,721.96	-15.54	21.14	35,086.10	35,158.57	0.21%	2.03
Oct 2020- Sept 2021	2,836,542.82	-17.70	19.37	393,418.98	394,972.63	0.39%	2.10

After 1 year of metering, findings were +/- 1.73% and the avg difference was 0.39% off from calculated energy use to metered performance of compressor co-efficiency.

- Column 5 shows the monthly power consumption values that were calculated using the controller raw data (rack pressure, temperature and compressor run data taken at 1 minute intervals used in analytical tools utilizing Bitzer Compressor formulas).
- Column 6 shows the % difference between the calculated power values compared to the values reported by the power metering equipment on the racks (0.39% average difference from Oct 2020 - Sept 2021).
- The low % difference gives a high degree of confidence that the analytical tools being used to interpret the rack data are accurate.
- This accuracy ensures that the refrigeration BTUs (also calculated from the Bitzer formulas) correctly reflect the actual amount of refrigeration work done (Column 1).

Publix

Annual Energy Comparison of CO2 Booster Systems

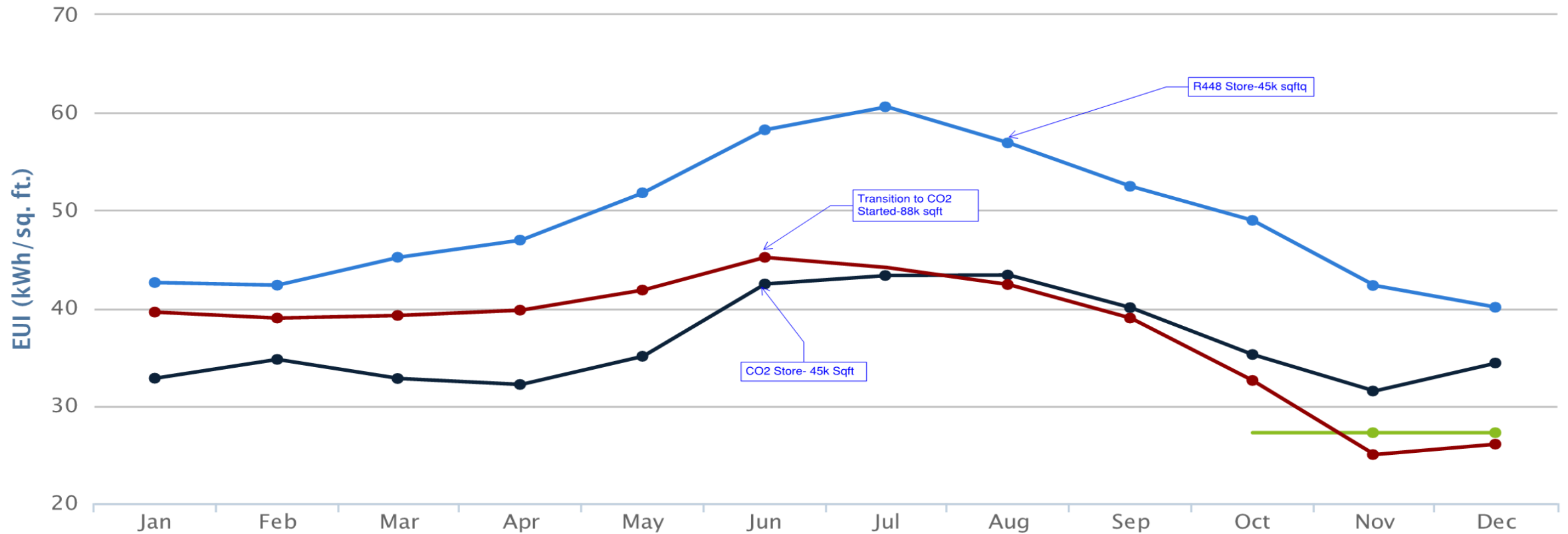


- Percentage represents energy performance of CO₂ Booster w/ adiabatic & parallel compression relative to R449A DX with dry cooler baseline
- With the right technology applied, CO₂ Booster Systems can achieve energy parity while providing long-term sustainable option to support Net-Zero goal

Publix

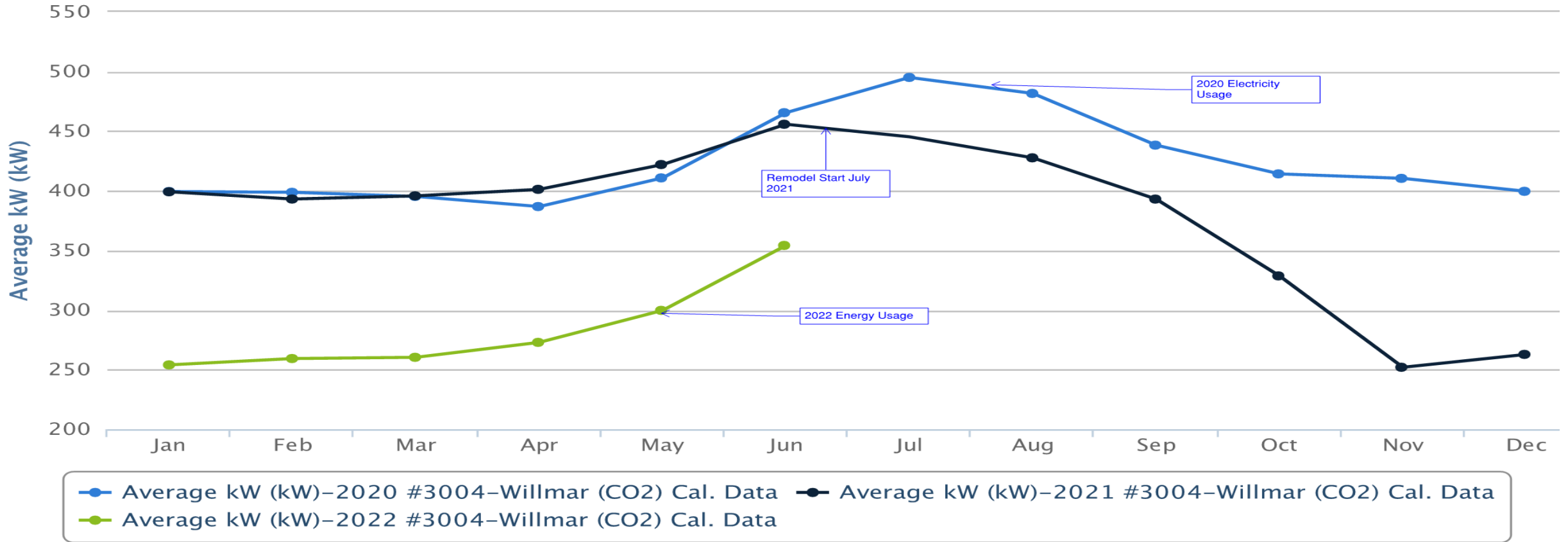
CO2 Advantages—Energy Savings

Click on chart container to pin or unpin tooltip



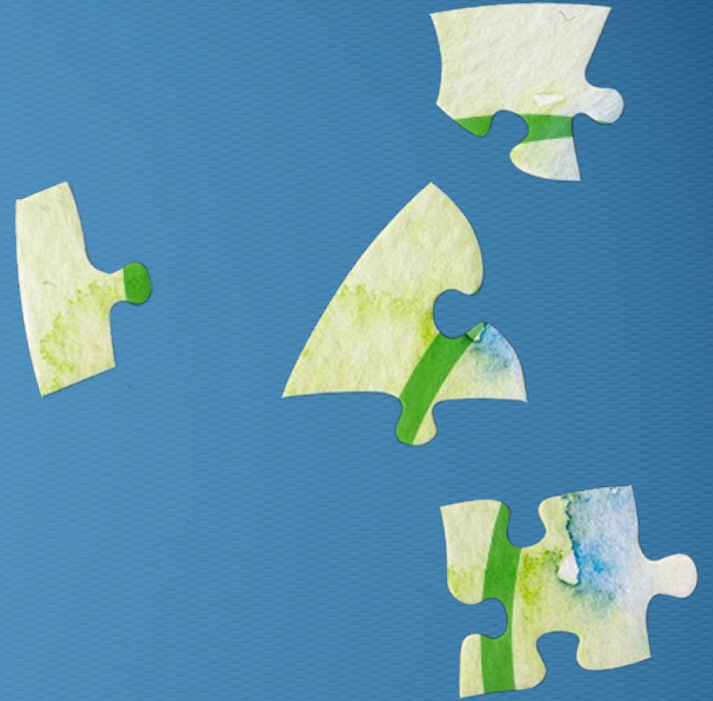
CO2 Advantages-Energy Savings

Click on chart container to pin or unpin tooltip





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5. Based on your experiences, what are some lessons-learned or considerations for first-time adopters?

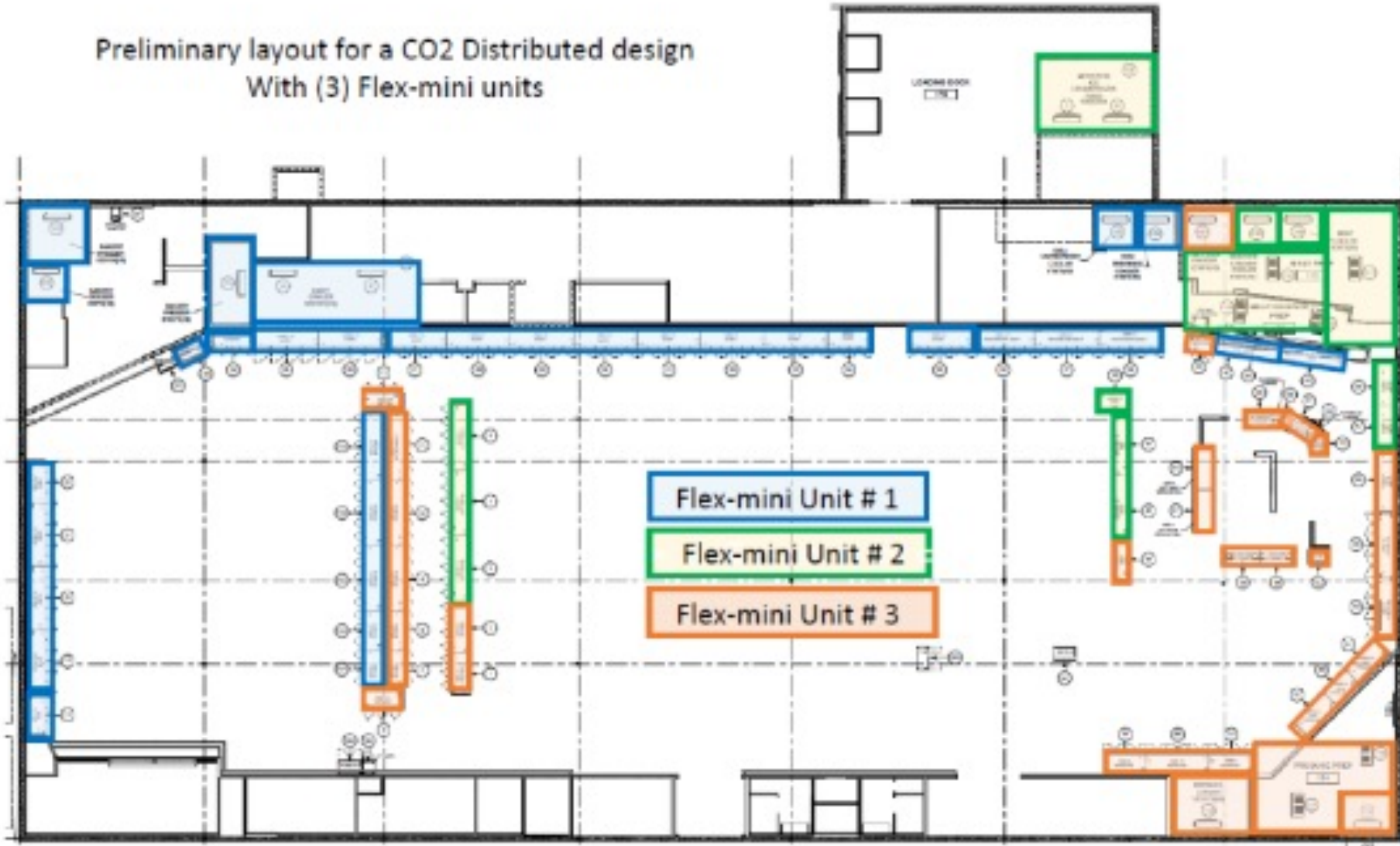
Publix Lessons Learned

- Contractors ability to install, start-up and provide support for service long term
- Availability of Refrigerant Grade R744 (Still a gap in some areas)
- Higher leak rates during start up and sometimes challenging to find leaks
- Total Cost of Ownership: still a work in progress.
- Work with your Systems and Controls manufacturers to review and develop a strategy
 - E.g., reliability & ease of maintenance
 - E.g., specifications of standards and consistent design parameters
- Discuss objectives for your retail floor plan
 - Walk-in cooler & freezer storage and prep areas
 - Reach-in doors cases vs. open multideck
 - Refrigeration design impact on total store operation

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Publix Adoption of CO2 Booster for Staged Remodels

Preliminary layout for a CO2 Distributed design
With (3) Flex-mini units

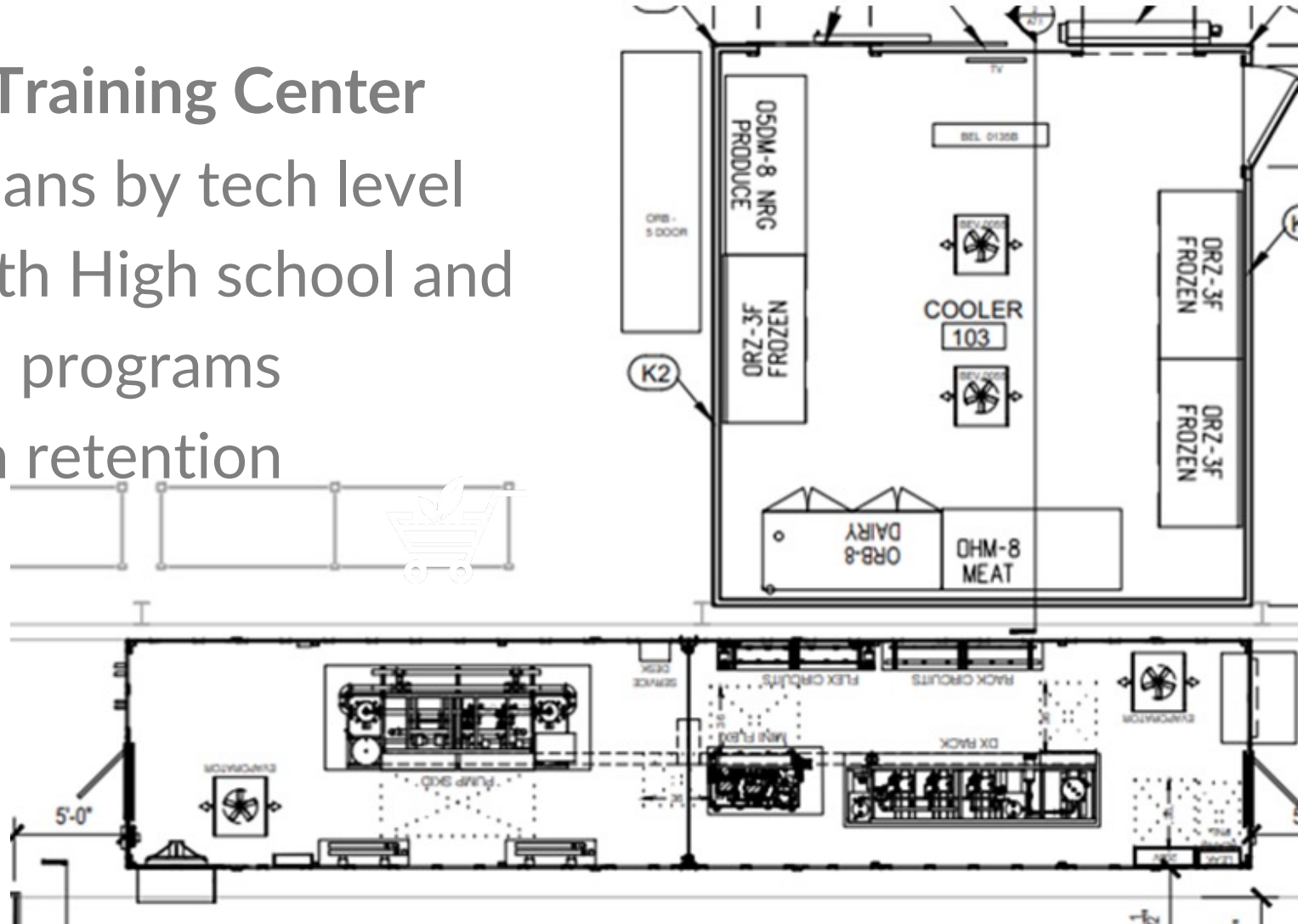


Focus on a staged approach for remodels to keep stores open and reduce impact on store operations

Publix

Publix Technician Training

- In-House Training Center
- Training plans by tech level
- Engage with High school and vocational programs
- Technician retention



Coborn's Lessons Learned

- Things to consider before choosing CO2
 - Climate
 - System running super-critical has more issues and higher energy
 - Refrigeration Contractor
 - Experience and a quality start up tech
 - System complexity
 - Electrical/EMS Contractor
 - Experience with Refrigeration Controls
 - Poor wiring can lead to chasing “Gremlins”



Coborn's Lessons Learned

- Disadvantages
 - Increase in service calls
 - Service Calls are more intensive
 - Longer down times for service
 - Longer restarts after power failures
 - Longer lead times on parts
 - Lease on full charge of CO₂ cylinders
 - Must tune compressor VFD harmonics
 - More Leaks



Coborn's Lessons Learned-Leaks



Q&A

