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Low GWP & Energy Efficiency Expo

Los Angeles, CA
January 2020

CO2 Refrigeration Technology – Current State

Advanced CO2 Refrigeration Technology

- ❖ Horizon Maps & Technology Roadmaps
- ❖ CO2 HVAC
- ❖ Ejector Technology
- ❖ Micro Distributed Systems
- ❖ Advanced Sub-cooler Technology

Q&A

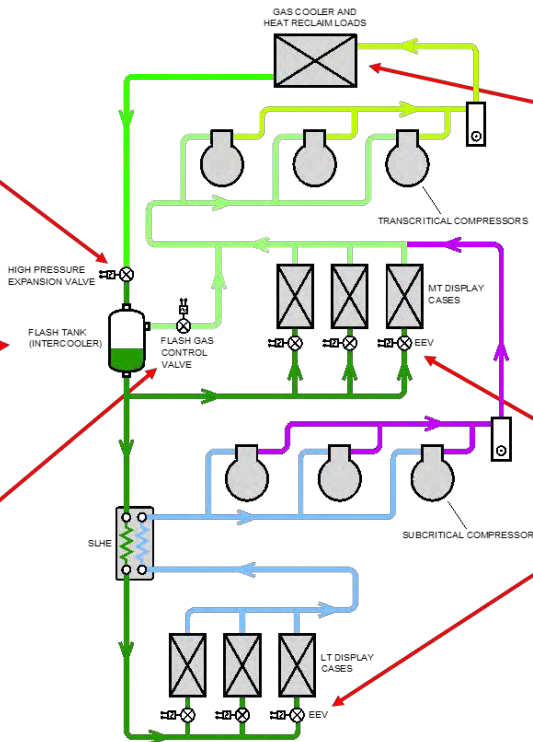
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Current State Advansor Booster System

High Pressure
Control Valve



Flash Tank (Receiver)



Flash gas by-
pass valve



Adiabatic gas cooler



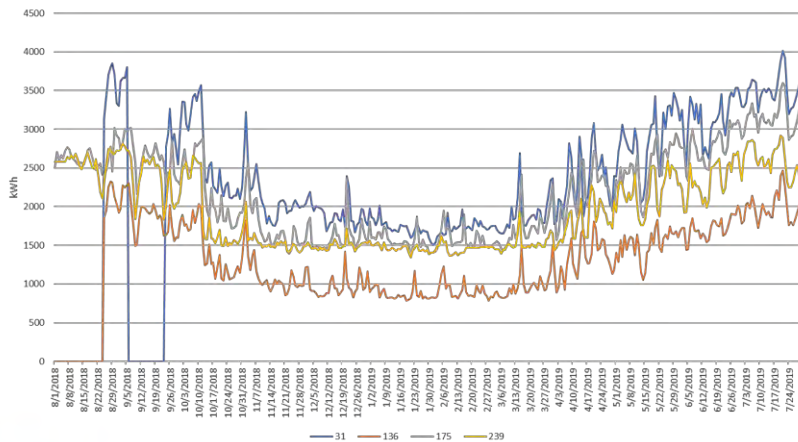
EEV's & Case
Controller

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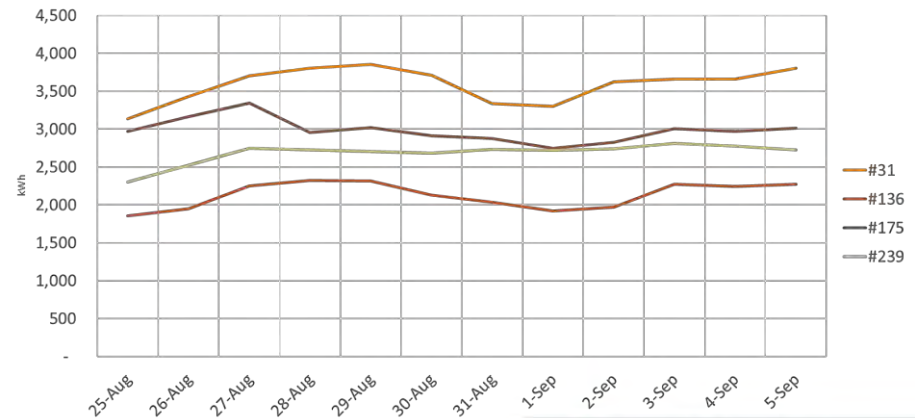
Weiss Supermarkets Case Study Summary

<u>Store</u>	<u>Age</u>	<u>Refrigeration Design</u>	<u>kWh Usage</u> <u>8/1/18 -</u> <u>7/31/19</u>	<u>Cost per year</u> <u>@</u> <u>\$0.122/kWh</u>	<u>Energy</u> <u>Increase</u> <u>vs. CO2</u>
#31	23 years	5 compressor racks, Air-cooled condensers, individual systems piping	892,282	\$108,858	80%
#175	7 years	6 Distributed racks, Loop piping, Microchannel condensers. First venture into case controls.	800,589	\$97,752	62%
#239	2 years	2 compressor racks [1 LT / 1 MT], Glycol MT secondary, Loop piping, Case controls, Adiabatic condensers	709,476	\$86,627	43%
#136	1 year	Hill CO2 Advansor, Loop piping, Case controls, Adiabatic gas coolers	494,541	\$60,383	

Daily Refrig. kWh 8/1/18-7/31/19

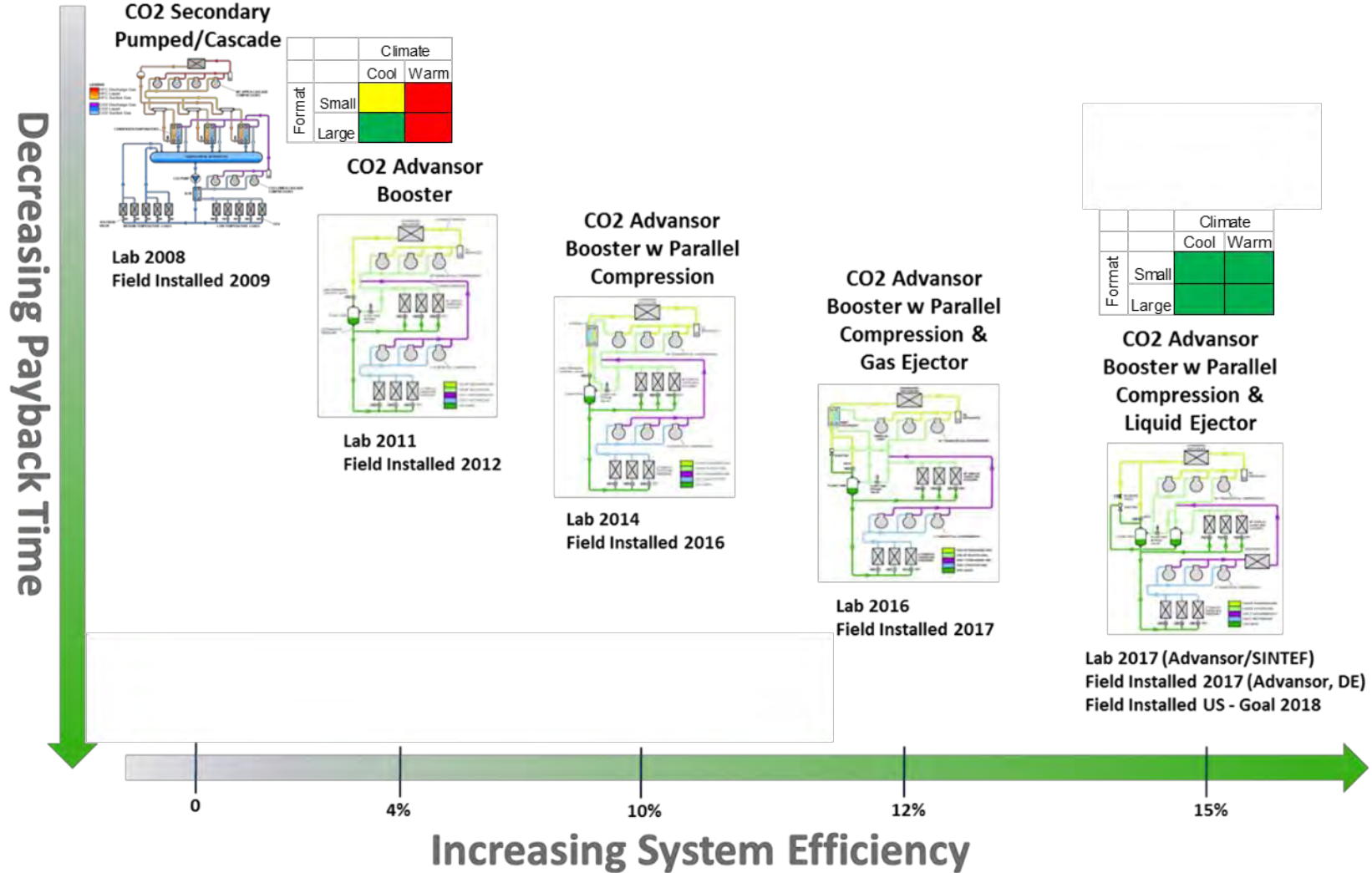


Refrigeration kWh – 95°F Ambient



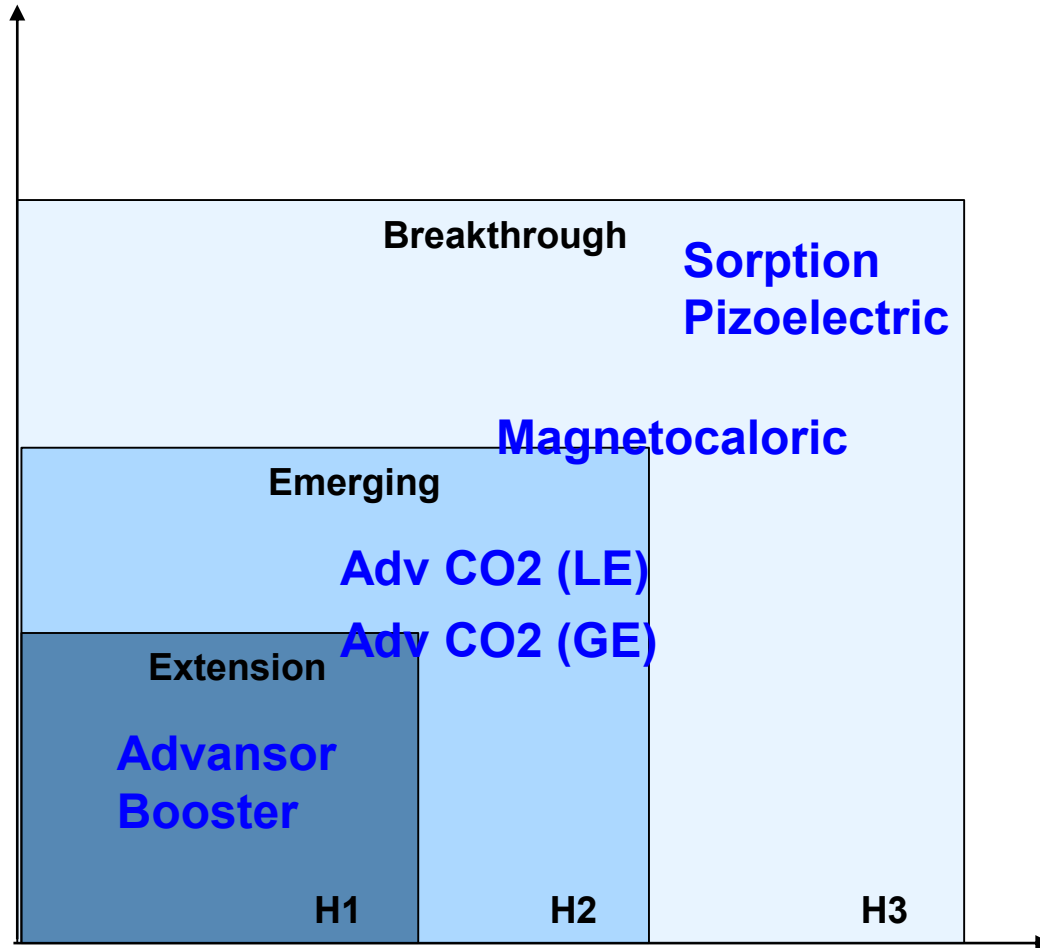
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Evolution of Advanced CO2 Technology



R&D Executive Review Meeting

CO2 Refrigeration Systems Horizon Map

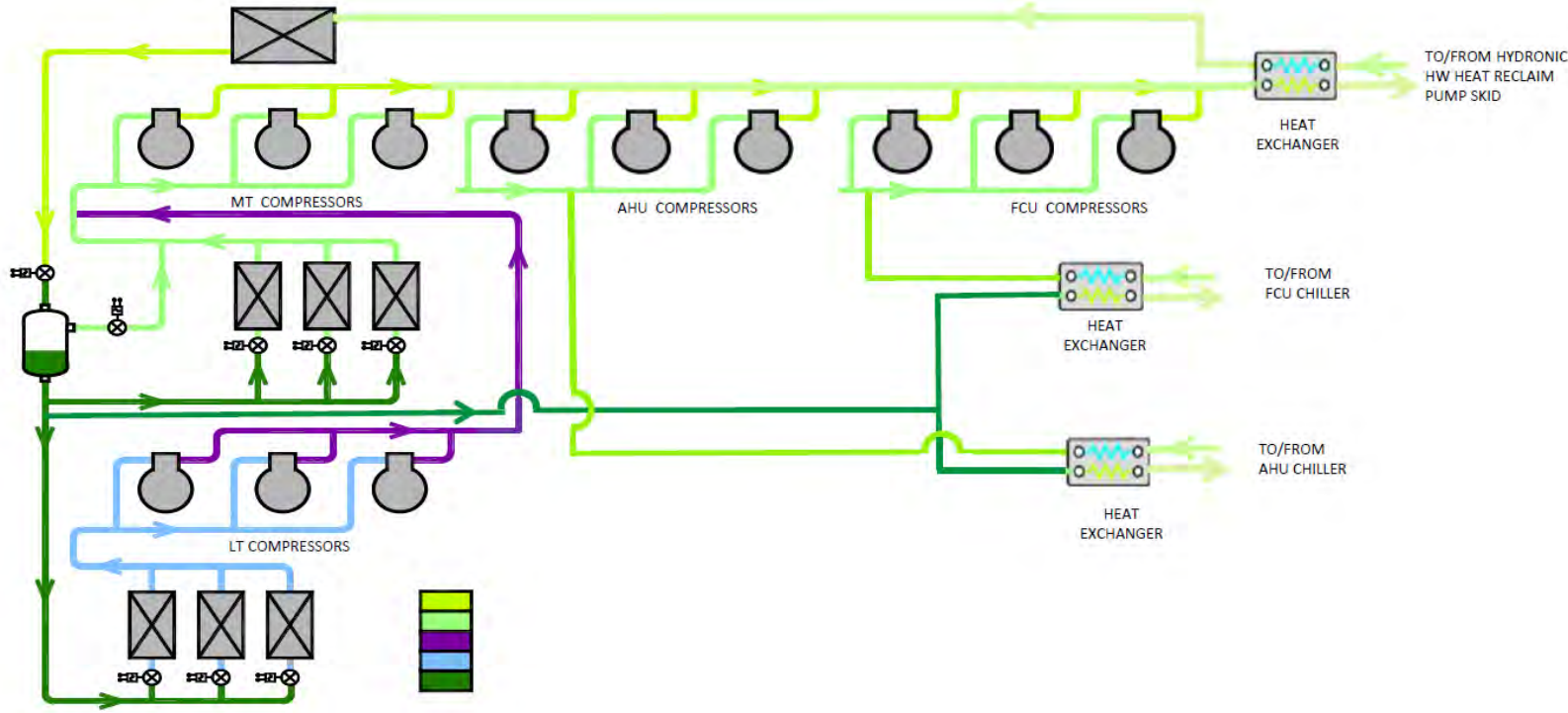


- R290 Propane Systems ●
- Ultra Low Charge Ammonia ●
- R744 CO2 – Gas Ejectors ●
- R744 CO2 – Liquid Ejectors ●
- Magnetocaloric Systems ●
- Sorption Technologies ●
- Pizeoelectric Technologies ●

Horizon 1 (<1year) Extension Horizon 2 (1-3 years) Emerging Horizon 3 (3+ years) Breakthrough

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CO2 HVAC – WFM Sunnyvale, CA



DESIGN RS-1 COOLING CAPACITY: 2,550 MBH

DESIGN RS-1 HEAT REJECTION: 3,600 MBH

- COOLING DEMAND**
- AHU 1: 415 MBH
 - AHU 2: 56 MBH
 - AHU 3: 314 MBH
 - AHU 4: 372 MBH
 - MED. CASES: 527MBH
 - LOW. CASES: 164 MBH
 - FCU: 685 MBH
 - TOTAL COOLING DEMAND: 2,533 MBH**

- HEATING DEMAND**
- AHU 1: 214 MBH
 - AHU 2: 104 MBH
 - AHU 3: 163 MBH
 - AHU 4: 189 MBH
 - DHW: 518 MBH
 - FCU: 220 MBH
 - TOTAL HEATING DEMAND: 1,408 MBH**

REMAINING HEAT REJECTION: 2,192 MBH
GAS COOLER: 2,192 MBH



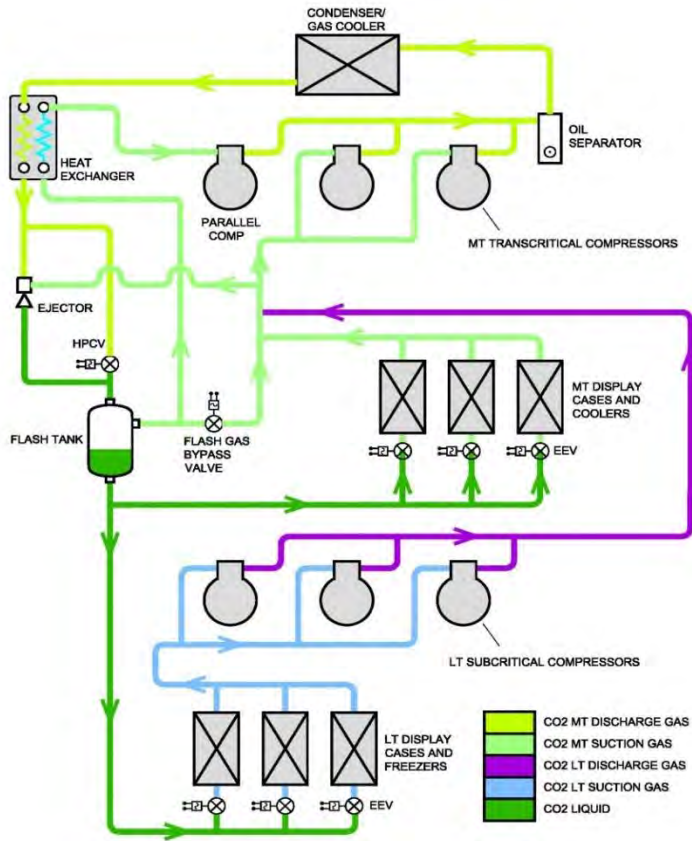
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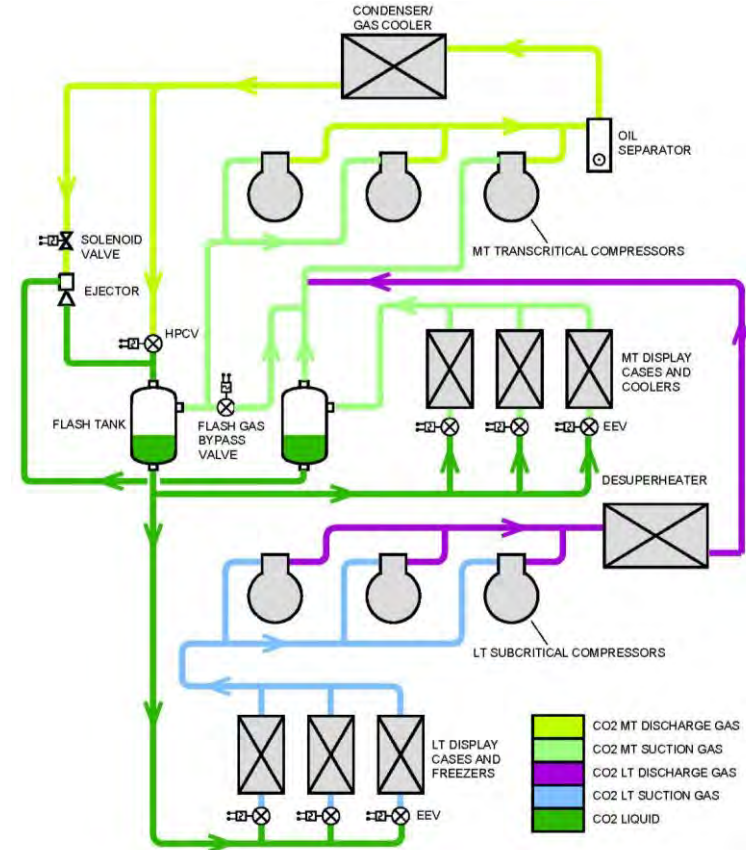
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Ejector Technology



**Advansor CO2 Booster System
with Parallel Compression
And Gas Ejector**



**Advansor CO2 Booster System
with Parallel Compression and Liquid Ejector**

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CO2 Refrigeration Training available

Learning Center



- The “Industry Standard” for training
- Standard and custom training programs for participating retailers
- Instructor-led and online curriculum
- Continue to invest and grow
- Received consecutive ASHRAE awards for the past six years

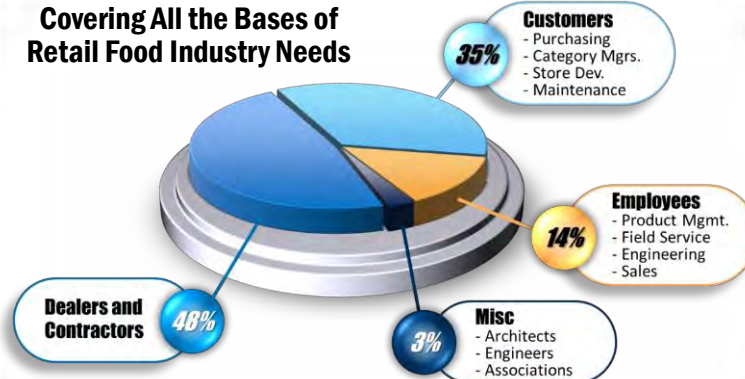


... Real Solutions

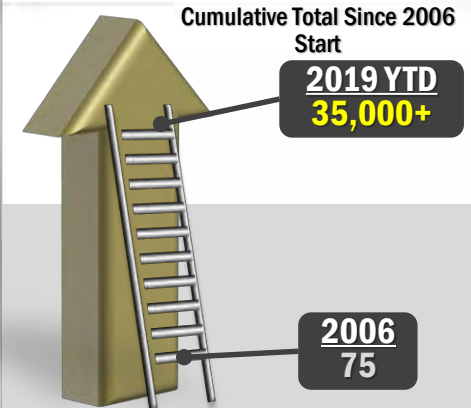
- Basic or Advanced Refrigeration Knowledge
- Energy Savings & Sustainable Technologies
- Latest Industry Technology
- Food Handling & Safety
- Merchandising & Technology That Sells More Products
- Supermarket Sense
- Food Trends

... for a Diverse Audience

Covering All the Bases of Retail Food Industry Needs



... and GROWING Fast!



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Advansor CO2 Technology from Dover Food Retail



One refrigerant. So many benefits.

ADVANSORTM

PART OF THE SECOND NATURE FAMILY OF HILLPHOENIX

Leading CO₂ technology for refrigeration.

- 100% environmentally friendly • non-toxic, inflammable
- no ozone depletion • no global warming impact
- low noise • single refrigerant • low cost of installation
- low cost of maintenance • compact design
- easy installation • easy service
- low energy consumption

future-proof solution

**Fresh thinking.
Responsible solutions.®**