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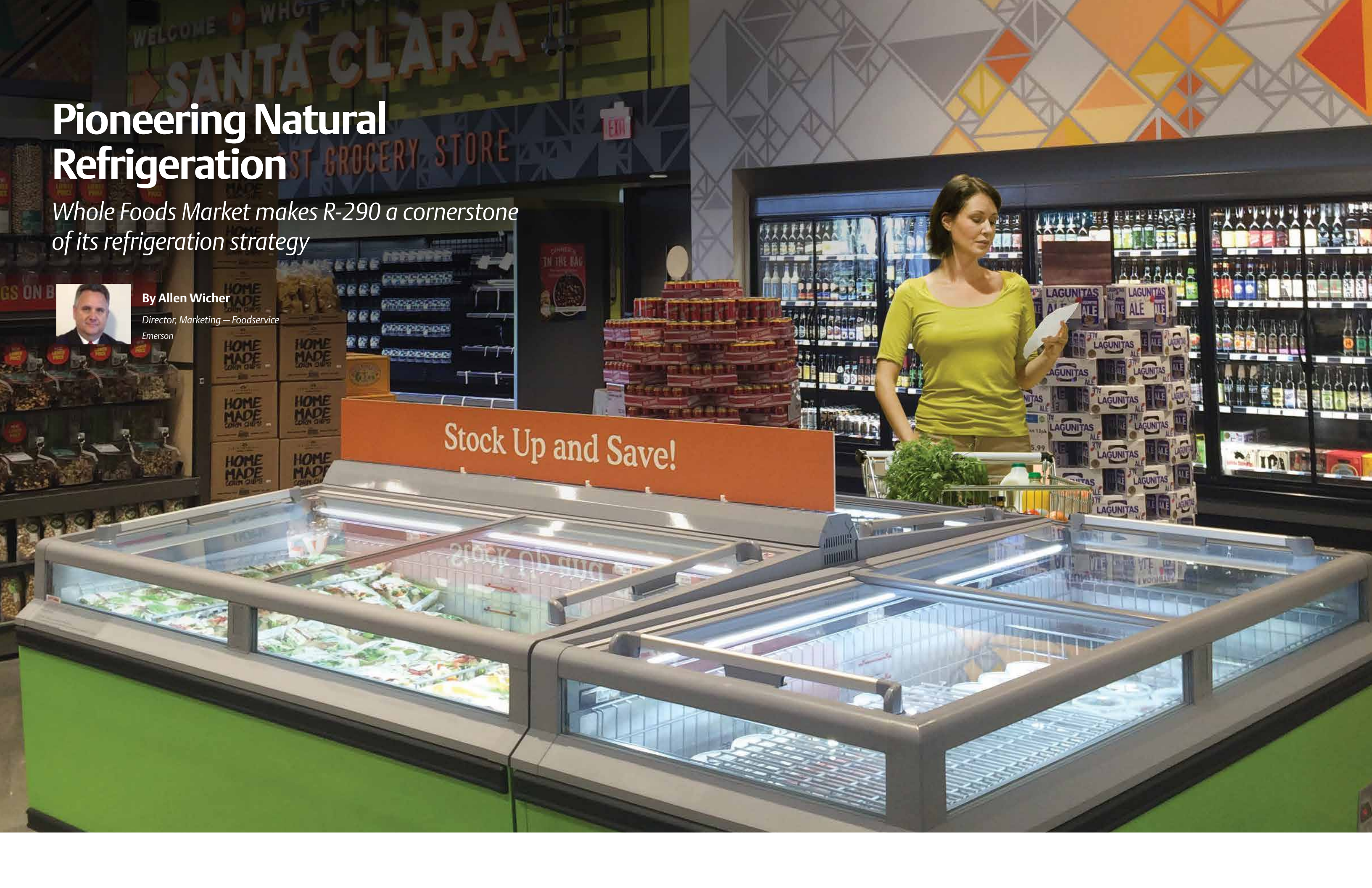
# Pioneering Natural Refrigeration

*Whole Foods Market makes R-290 a cornerstone of its refrigeration strategy*



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When it comes to the use of natural refrigerants in commercial refrigeration, Whole Foods Market (WFM) is a true pioneer in the U.S. food retail space. Even before the recent wave of regulations prompted retailers to look for more eco-friendly alternatives, WFM was deploying sustainable refrigeration systems with the intent of reducing harmful environmental impacts and improving energy efficiencies. Today, 22 of its 465 stores utilize all-natural refrigerant systems, with most of them moving to the hydrocarbon R-290 (propane) for their self-contained cases.

WFM's Director of Sustainability & Facilities for its Northern California region Tristram Coffin has been dedicated to fulfilling the company's green refrigeration vision.

"Refrigeration makes up roughly one-third of our total energy consumption, and we're committed to natural refrigerants because they reduce our energy consumption and direct environmental footprint through potential emissions from refrigerant leaks," said Coffin.

But figuring out a natural solution for their self-contained cases presented a unique challenge for the retailer. In 2013, when

WFM sought to open its first "natural store" in Brooklyn, N.Y., with zero synthetic refrigerants on premises, they went on the hunt for a more efficient, self-contained natural refrigerant option.

"We didn't want to just drop a bunch of inefficient, synthetic refrigerant cases on our sales floors, because they would negatively impact our energy usage and go against our sustainability efforts, especially in stores where we are utilizing all-natural refrigerants," explained Coffin.

Although R-290 was becoming the refrigerant of choice for retailers looking for a natural, self-contained case option, at the time there were very few U.S. refrigeration equipment manufacturers that offered R-290 units. But AHT Cooling Systems USA was on this short list. AHT National Sales Manager Howell Feig said that developing R-290 products for the European market enabled AHT to help early adopters in the U.S.

"We had been manufacturing bunker-style cases for our European customers since 2002, and around 2010 some of our environmentally driven U.S. customers started asking for self-contained, R-290 based equipment," Feig said. WFM was among the early adopters of these R-290 cases.

Since the 2013 Brooklyn installation, Coffin said that R-290 self-contained cases have been deployed across the company's entire network of stores. He estimated that 50 to 60 stores a year are installing new cases — as replacements to HFC units, in new stores, or in new programs being rolling out by WFM.

"While these units make up less than 10 percent of our overall refrigeration footprint, they have hit a home run for us in that they're 10 percent more efficient in most instances, and they're using a natural refrigerant," Coffin said.

Both Feig and Coffin believe that the U.S. food retail industry is slowly shifting toward R-290 use in self-contained cases. From AHT's perspective, Feig explained that early adopters like Whole Foods Market have served as a proof of concept for less progressive retailers. As a result, adoption has increased to the point where AHT will transition its entire equipment platform to R-290 by the end of this year. Whether for meeting regulatory mandates, seeking energy efficiency gains or adhering to sustainability objectives, Coffin believes that R-290 cases are becoming more commonplace — to the point that some end users aren't even aware that they're using R-290 units.

#### Sustainability commitment drives innovation

Sustainability is a core value that has driven WFM since its inception. As a member of the Department of Energy's Better Buildings®

Alliance, they are participating in a challenge which is focused on reducing their overall energy use intensity (EUI) footprint 20 percent by 2020. This initiative comes on the heels of their previous 2010 goal to reduce energy-use-per-square-foot 25 percent by 2015 — a target Coffin says they nearly hit.

"We're also a founding partner of GreenChill in support of what we do around refrigerants, seeking to reduce both direct refrigerant emissions and overall GWP using natural alternatives," added Coffin.

WFM's mission to provide healthy food with a passion for preserving the planet has led to experimentation with innovative system architectures. Coffin explained that there's no "one-size-fits-all" solution and every store is evaluated individually based on the facility's characteristics and climate impacts.

In 2016, this spirit of innovation led to the opening of their facility in Santa Clara, Calif.; it features what's arguably the most environmentally friendly refrigeration system in the U.S. The system is based on an R-290/CO<sub>2</sub> cascade architecture that reduces the environmental impacts of refrigerants to near-zero, while greatly improving energy efficiency.

This unique system uses R-290 to condense CO<sub>2</sub> — the most eco-friendly refrigerant available with a climate impact that is thousands of times smaller than typical HFCs — which is then distributed to connected cases throughout the store. CO<sub>2</sub>'s high

## Compression technology designed to exploit R-290 efficiencies

### Emerson Propane Compressor Lineup



Model ASE — R-290 compressor

#### Low-Temperature

R-290	AFE06	AFE10	AFE13	AFE16	RFT22	RFT26	RFT37
Capacity (BTU/Hr)	626	980	1330	1643	2200	2640	3690

#### Medium-Temperature

R-290	ASE12	ASE17	ASE18	ASE24	ASE32	RST37	RST44	RST53	RST58
Capacity (BTU/Hr)	1200	1653	1789	2448	3240	3660	4420	5304	5772

With a global warming potential (GWP) of 3, zero ozone depletion potential and proven performance benefits, R-290 offers very minimal environmental impacts and higher energy efficiencies than hydrofluorocarbon (HFC) refrigerants.

For years, Emerson has tested R-290 in compressors and condensing units to help OEMs like AHT make the transition to environmentally friendly, energy-efficient technology. In Emerson's test labs, R-290 consistently outperforms R-404A in energy efficiencies, up to 30 percent in Copeland™ M-Line condensing units and more than 20 percent in Copeland hermetic compressors.

heat-carrying properties reduce both the amount of refrigerant needed and the energy required to run the refrigeration system. Simultaneously, a heat reclaim system captures the heat generated by the system, and uses it to preheat the store's hot water supply and supplement space heating — a strategy that enables the store to greatly reduce the amount of natural gas burned to heat water.

“The system uses the least possible amount of the most climate-friendly refrigerants, while reducing the energy it takes to operate it and re-using the heat it generates,” said Coffin. The Santa Clara store also features 10 of AHT's self-contained cases for product showcases on the floor.

#### **Safety, serviceability and charge limits**

From a safety and servicing perspective, Coffin believes that the novelty of R-290 in the U.S. brings with it a degree of apprehension about its impacts to service technicians and end users. While safety protocols are mandatory with the use of the class A3 (flammable) refrigerant, Coffin feels that the perceived risks are often not proportionate to the actual risks.

“The reality is we use natural gas and propane to heat and cook for residential and commercial purposes all the time in this country. It's simply a matter of educating end users and technicians about proper safety protocols,” Coffin said. “Plus, self-contained OEMs have done an excellent job of making these systems safe and user-friendly, and training their service technician base,” he added.

Coffin and Feig concur that increasing the charge limit of R-290 systems (currently at 150g) would open new opportunities that aren't currently possible. Coffin said that an increase to 500g would allow R-290 to be used in open-door cases as well as walk-in coolers and freezers. This prospect could potentially even allow for a full-store solution of self-contained R-290 cases, which would be particularly advantageous in smaller urban locations where space constraints prevent the use of centralized racks.

“Increasing the charge limits would enable significant advances in system design and efficiencies,” said Feig.

Even at the current charge limit, Coffin said that the R-290 cases are a solution they plan on using for many years to come. 🌱

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