



## WHOLE FOODS MARKET DUBLIN, CA

CASE STUDY #4, AUGUST 2016

<b>System Type:</b> CO <sub>2</sub> / NH <sub>3</sub> Cascade	<b>Refrigerant:</b> R-744 / R-717)	<b>GWP:</b> 1/0
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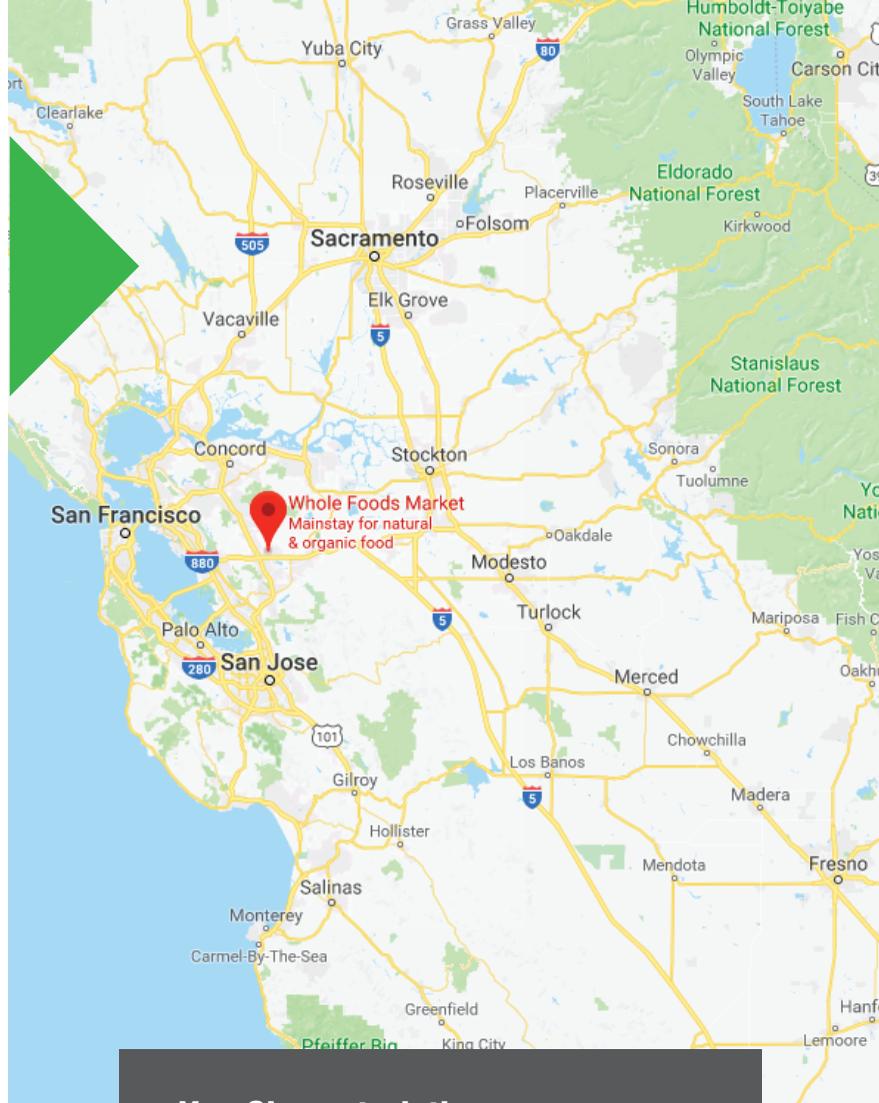
**Store Size:** 40,689 gsf (gross square feet)

**ASHRAE Climate Zone:** 3

**Utility Provider:** Pacific Gas & Electric

**Average Electricity Cost:** \$0.16/kWh

**System & Charge:** CO<sub>2</sub> / NH<sub>3</sub> Cascade



## WHOLE FOODS MARKET DUBLIN, CA

### Key Characteristics:

Low-temp DX CO<sub>2</sub> with medium-temp liquid overfeed CO<sub>2</sub>, cascaded to R-717 hybrid condensers; using electric defrost. This system is a suburban location with a warm ambient climate, and was the first of its kind in the U.S. when it was brought on-line.

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### SYSTEM BASICS

System: CO<sub>2</sub> / NH<sub>3</sub> Cascade with 1,440-lb charge of R-744 (carbon dioxide) and 250-lb charge of R-717 (ammonia).

System location: The CO<sub>2</sub> rack is located on the mechanical platform and the NH<sub>3</sub> rack is located in house on the roof.

System capacity: Low temp capacity is 126M BTU/hr and medium temp capacity is 618M BTU/hr.

This store is located about an hour outside of San Francisco headed toward the central valley. At the time, there was very little information about transcritical CO<sub>2</sub> in warm climates, but Whole Foods was committed to a natural refrigerant solution.

The Dublin area is surrounded by many industrial ammonia cold storage facilities, thus Whole Foods felt this technology was an opportunity to pilot a natural refrigerant solution and compare it to its deployed HFC DX systems, HFC/ CO<sub>2</sub> cascade systems and transcritical CO<sub>2</sub> systems.

This system was a first of its kind for Whole Foods and at the time it was brought online it was the only system of its kind operating in a U.S. grocery store. Whole Foods has encountered several issues with the NH<sub>3</sub> rack and has been continually commissioning and changing out equipment during the first year of operation.

Safety precautions include a shower in case of a NH<sub>3</sub> leak, as well as personal protection equipment to deal with a small discharge of NH<sub>3</sub>.

**CONTACT US**

✉ [info@nasrc.org](mailto:info@nasrc.org) [www.nasrc.org](http://www.nasrc.org)

## QUANTIFYING & COMPARING ENERGY USE

Whole Foods Market does not have a typical system in the same climate zone built around the same time. Generally, a typical system for Whole Foods would be a R-407A DX parallel rack configuration. In this case, Whole Foods used a distributed R-407A scroll unit system with hybrid condensers at a 39,026 gsft (gross square feet) store in Fremont, CA as a baseline.

Case doors are a standard practice for CA stores, and the department formats are similar in terms of case lineups. The installation costs for this CO<sub>2</sub>/NH<sub>3</sub> system were roughly double the comparable baseline system.

This CO<sub>2</sub>/NH<sub>3</sub> system has electronic controls and initial settings were confirmed during commissioning. Operating guidelines changed slightly during the first year, due to lessons learned in the field.

The CO<sub>2</sub> and NH<sub>3</sub> racks have separate sub-meters, as do the two hybrid condensers. Twenty-five percent of the heat rejected off the rack is utilized for space heating, the remainder is used for pre-heating domestic hot water.

## WHAT WHOLE FOODS MARKET SAYS

“Due to continual commissioning and the need for equipment swap outs like valve and compressor replacements, service costs have been higher than expected.

Ultimately, we expect energy savings and decreased servicing needs as compared to a traditional system. Simply put, we need more than one natural refrigerant solution and this system is a viable option.

We remain confident that it will meet our expectations, and the installing contractor and OEM have stood by their commitment to deliver on our expectations.”

The North American Sustainable Refrigeration Council is a 501(c)(3) nonprofit dedicated to advancing natural refrigerants and creating a more sustainable future for retail food refrigeration. Learn more at <http://nasrc.org>

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### Average Energy Consumption (Annualized kWh/Sq Ft) by System Type

Whole Building	43.8
Refrigeration	15.3
HVAC	0.9
Lighting	10.4
Other	9.4

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