



Opteon™ XP40

Refrigerant

Raley's Supermarkets Champions
the Transition to Non-Ozone
Depleting, Reduced Carbon
Footprint Refrigerants with
Opteon™ XP40 (R-449A)



Background

Raley's Supermarkets is a family owned chain that takes pride in its leadership and commitment to environmental sustainability. In addition to sustainability projects like reducing energy usage from lighting, the installation of solar panels, and generating natural gas from store waste, Raley's is also leading the industry in its transition to non-ozone depleting, low global warming potential (GWP) refrigerants.

When Raley's corporate engineering and energy groups considered the future of commercial refrigeration in light of new regulations and their own sustainability goals, they consulted with technical experts from long-time refrigerant producer Chemours (formerly DuPont Performance Chemicals) for the latest developments and low GWP options.



Chemours™





After the teams met, Raley's quickly identified an initial test store in Santa Rosa, CA for conversion to the newest low GWP refrigerant from Chemours, Opteon™ XP40 (R-449A). XP40 is a hydrofluoroolefin (HFO) blend that has zero ozone depletion potential (ODP) and a >65% reduction in GWP over the incumbent R-404A refrigerant. The team's project goals were to understand the retrofit details, validate operational performance, and measure energy performance of the new HFO refrigerant.

Opteon™ XP40 Refrigerant

Opteon™ XP40 is a nonflammable, low GWP refrigerant based on new HFO technology that offers excellent performance along with improved environmental and energy properties.

Opteon™ XP40 Properties

ASHRAE Number	R-449A
Lubricant	POE
Boiling Point	-46.0 °C (-50.7 °F)
Safety Classification	A1
Temperature Glide	-4 K (-7 °R)

Overview of Refrigeration System and Conversion to Opteon™ XP40 (R-449A)

The refrigeration system in Raley's Santa Rosa store provides both low temperature (frozen food) and medium temperature (produce, meat, dairy) refrigeration, as well as air conditioning and hot water for the store. The system was originally designed to operate using R-404A refrigerant.

The Santa Rosa conversion project was completed overnight in October 2014 by PMC Mechanical Inc., following retrofit guidelines provided by Chemours. Because the refrigeration system was already operating on POE oil, no lubricant change was required. Additionally, no change out of seals or gaskets was needed. After startup on XP40, the only major work required was to check and adjust the superheat on the individual TXVs, due to the lower mass flow rate of XP40 vs. R-404A. The existing valves were turned down to obtain the proper superheat and prevent liquid flood back. The system cases and walk-ins quickly pulled down to temperature and have operated reliably since the conversion.

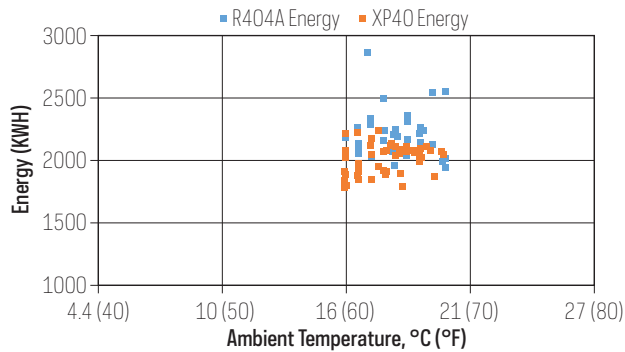
Operational and Energy Performance

The table below provides operational data measured at similar ambient conditions for the system prior to, as well as at 1 week and 6 months, post-conversion to Opteon™ XP40. XP40 is shown to be operating as expected and consistently over this time frame.

	Daily Average Value		
	Pre-Retrofit October 2014 R-404A	1 Week Post-Retrofit November 2014 XP40 (R-449A)	6 Months Post-Retrofit April 2015 XP40 (R-449A)
Condensing Pressure, barg (psig)	11.389 (167.3)	11.300 (166)	11.368 (167)
Discharge Temperature, °C (°F)	60.2 (140.3)	72.1 (161.8)	74.4 (165.9)
Ambient Temperature, °C (°F)	19.7 (67.4)	17.6 (63.6)	16.7 (62)
Medium Temperature Suction Pressure, barg (psig)	3.662 (53.8)	3.336 (49)	3.322 (48.8)
Medium Temperature Suction Temperature, °C (°F)	12.2 (54)	17.2 (62.9)	19.2 (66.5)
Low Temperature Suction Pressure, barg (psig)	1.103 (16.2)	0.837 (12.3)	0.837 (12.3)

Energy performance of the system has also been monitored since the conversion. Below is a plot of daily energy usage (KWH) vs. average daily temperature for selected days in the 16-20 °C (60-68 °F) range for R-404A as well as XP40. Reduced energy usage on the order of 8-9% is observed.

Total Energy Usage for Days at 16-20 °C (60-68 °F)



After one year of operation, a sample of the refrigerant and lubricant were collected from the system and submitted for analysis. Laboratory results for both the POE oil and XP40 showed them to be clean and acid-free, with no indication of degradation.

Conclusion

The refrigeration system for the entire store at the Raley's Supermarket in Santa Rosa, CA was successfully converted from R-404A refrigerant to low GWP HFO-based Opteon™ XP40 (R-449A). The system has now been operating as expected for over one year with all parties pleased with the results. Raley's has plans to convert other stores from R-404A to XP40 in the future; where other than making adjustments to the system controller set points and medium temperature TXVs, they plan on changing low temperature TXVs to fully optimize efficiency.

"Year after year, we've been recognized nationally by the Environmental Protection Agency (EPA) GreenChill program as a sustainability innovator within the grocery industry," said Randy Walthers, Raley's Manager of Energy and Utilities, who captained the team that has improved energy efficiencies throughout the company. "Raley's is proud of our continued focus on sustainability, and we have even more plans going forward. It's about doing what's right," Randy added.

For more information on the Opteon™ family of refrigerants, or other refrigerants products, visit opteon.com or call (800) 235-7882.

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