



Opteon™ XP40

Refrigerant (R-449A)

Performance, Energy, and Sustainability Success at Major Supermarket Chain with Opteon™ XP40 Refrigerant



Background

A major supermarket retailer has been a leader in food retail operating in the northeastern United States for over 100 years. Like many chains across the country, the company has ensured food quality and safety using systems charged with HCFC-22 to provide low- and medium-temperature refrigeration.

Recently, as the commercial refrigeration industry transitions out of R-22 (U.S. production ends December 2019), the retailer, along with a team from its facilities management consultant, saw an opportunity for a move to a more environmentally sustainable, yet cost-effective, solution.

After evaluating the refrigeration systems and options, the consultant's engineering manager made the recommendation for the supermarket chain to convert its R-22 systems to Opteon™ XP40 (R-449A) refrigerant based on its excellent performance and operating parameter match in the existing equipment.

The retailer's maintenance and engineering manager also saw this as a great opportunity as Opteon™ XP40 is not only non-ozone depleting, but also has a 27% lower global warming potential (GWP) than R-22, helping the company to stay on track with its corporate sustainability goals.



Chemours™



The first two R-22 to Opteon™ XP40 conversions took place in the fall of 2015 at a store in the Boston area.

Opteon™ XP40 Refrigerant

Opteon™ XP40 is a low GWP, non-ozone depleting, replacement for both R-22 and R-404A. As shown in **Table 1**, the performance match of Opteon™ XP40 relative to R-22 is excellent.



Table 1. Performance of Opteon™ XP40 vs. R-22*

Refrigerant	Relative Capacity	Relative COP	Relative Mass Flow	Suction Pressure (psig)	Discharge Pressure (psig)	Discharge Temperature (°F)
Opteon™ XP40	1.03	0.95	1.09	48.4	243.9	180.5
R-22	1.00	1.00	1.00	43.1	210.7	209.2

*At -6.7 °C (20 °F) Evaporator, 10 °C (50 °F) Return Gas, 40.5 °C (105 °F) Condenser, and 35° C (95 °F) Sub-Cool Temperature

Overview of R-22 Refrigeration Systems Conversion to Opteon™ XP40

Medium-temperature refrigeration in the Boston-area store was provided by two independent parallel rack systems, originally designed for R-22, serving produce, meat, and dairy cases, as well as walk-in coolers and prep areas. Each rack contained approximately 700 lb of R-22.

The conversion of the refrigerant in each of the systems took place on separate evenings in October 2015. Following the procedures detailed in the Chemours “Retrofit Guide” (www.opteon.com), the mineral oil was replaced with POE oil prior to the retrofit. In order to minimize potential for leaks, all critical elastomeric seals were replaced during the gas change out—standard practice for any R-22 retrofit.

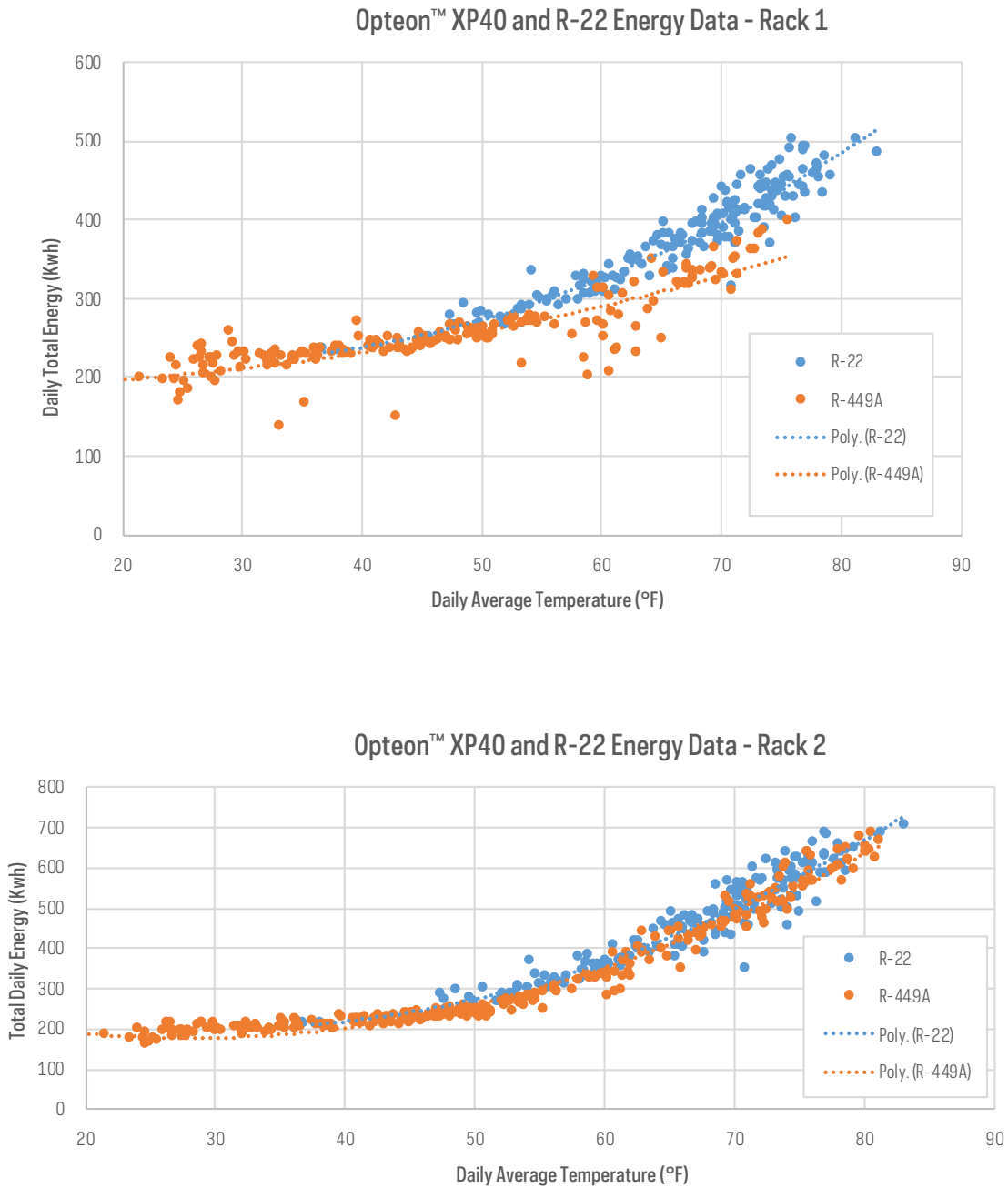


Because the mass flow rate and suction pressures of Opteon™ XP40 are very similar to those of R-22, no replacements or major adjustments to the TXVs were needed. Once the system was charged with Opteon™ XP40 and started up, cases and walk-in coolers quickly reached set point temperatures. The morning after each retrofit, technicians made minor adjustments to the TXVs as needed, and the suction pressures were optimized to achieve equivalent average evaporator temperatures as with R-22. Opteon™ XP40 has continued to provide dependable cooling for these supermarket racks since then.

Energy Performance

A few months prior to the Opteon™ XP40 conversion, energy monitors were installed on the R-22 racks to establish baseline performance. Data, over a wide range of ambient conditions, was collected hourly and reported by a third party firm for several months. **Figure 1** plots the total daily energy (kWh) used for each rack versus the daily average ambient temperature (°F) for both R-22 and Opteon™ XP40 refrigerants.

Figure 1. Daily Energy Usage Versus Ambient Temperature for MT Racks Running on R-22 and Opteon™ XP40



The energy plots in **Figure 1** show the expected increase in energy usage with increasing ambient temperature. The data also clearly shows that Opteon™ XP40 has lower energy consumption when compared to R-22 over the entire range of ambient temperature conditions. Across all of the data recorded, the average energy reduction benefit of Opteon™ XP40 was 8-10%.

Conclusion

All medium-temperature R-22 racks at the supermarket were successfully converted from R-22 to Chemours low GWP refrigerant, Opteon™ XP40.

Noted the facilities management consultant, “The conversions themselves were straightforward and went as planned, and these racks have been operating well, meeting all cooling demand while providing a reduction in energy usage.”

In addition to decreasing its energy costs by retrofitting to Opteon™ XP40, the supermarket chain has also successfully lowered both its direct (lower GWP refrigerant) and indirect (lower energy impact) carbon footprint.

As the phaseout of R-22 enters its final year, operators in the commercial refrigeration industry are finding Opteon™ XP40 provides a proven and cost-effective solution to improve the efficiency of their existing equipment infrastructure while transitioning to more sustainable refrigerants.



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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