

CASE STUDY

Arkema's Forane[®] 427A Refrigerant – The Easy Retrofit™

Sherm's Thunderbird Markets, Roseburg, Oregon

BACKGROUND

As the HVACR industry continues to move away from R-22 due to regulatory pressures, Arkema's Forane[®] 427A refrigerant (R-427A) has proven itself as an excellent retrofit candidate for air conditioning and refrigeration applications. R-427A is an easy to use, non-ozone depleting HFC refrigerant, which, in addition to having comparable performance to R-22, has one of the lowest global warming potentials of any R-22 retrofit refrigerants available today.

A good example of a Forane[®] 427A refrigerant application was a supermarket retrofit completed at Sherm's Thunderbird Markets in Roseburg, Oregon. Thunderbird Markets' maintenance manager, Frank Bartyzal, was introduced to Forane[®] 427A refrigerant by their wholesaler, Refrigeration Supplies Distributor (RSD). Frank was interested in R-427A due to its ability to closely match R-22's capacity and efficiency, while reducing compressor discharge temperatures.

RETROFIT APPLICATION

Sherm's Thunderbird retrofitted three systems, each utilizing three to four semi-hermetic compressors rated from 22 – 30 HP. These consisted of a low temperature rack for ice cream cases (-25°F evaporator, -10°F case temp), a second rack for frozen food cases (-15°F evaporator, 0°F case temp), and a third medium-temperature rack for deli cases and store heat reclaim (20°F evaporator, 38°F case temp). The store's overall initial R-22 charge weighed in at about 2,400 lbs. The retrofit was led by Sherm's Thunderbird's contractor, B&B Refrigeration, with Arkema's Technical Service on site for support.

Not having to replace the TXVs was an important factor to Manager Frank Bartyzal, when considering R-427A as a retrofit solution. Retrofits to Forane[®] 427A refrigerant don't require the change out of expansion valves or other major components. Filter-driers were replaced, per standard retrofit procedures, and the system mineral oil was replaced with polyolester (POE).



PROJECT

Sherm's Thunderbird Markets

LOCATION

Roseburg, OR

APPLICATION

**Supermarket Refrigeration
(LT & MT)**

REFRIGERANT

Forane[®] 427A (R-427A)

LUBRICANT

Polyester (POE)



TXV superheat settings were adjusted to ensure optimal performance.

It is worth noting that POE may not always be required or R-427A. Systems with oil separators and reliable oil return may be able to keep the original system oil. For systems without oil separators, a partial oil change to POE is recommended for the most reliable oil return.

RESULTS

As seen in the table to the right, the retrofit was a success with case temperatures maintained at the desired set-points and lower compressor discharge temperatures. Furthermore, the Forane® 427A refrigerant retrofit actually reduced the racks' total operating energy costs by an average of 7%. The system has been operating well, and there have been no major problems with the changeover. According to Frank Bartyzal, he "would recommend it to others." Subsequently, he converted his Medford, Oregon market to Forane® 427A refrigerant as well.

TABLE 1

FORANE® REFRIGERANT BASIC PROPERTY DATA	R-22	R-427A
AVERAGE MOLECULAR WEIGHT (G/MOL)	86.5	90.4
NORMAL BOILING POINT (NBP) (°F)	-41.5	-45.3
LATENT HEAT OF VAPORIZATION AT NBP (BTU/LB)	100.6	101.8
CRITICAL TEMPERATURE (°F)	205.1	185.6
CRITICAL PRESSURE (PSIA)	723.7	637.0
DENSITY OF SATURATED VAPOR @ NBP (LB/FT ³)	0.29	0.30
DENSITY OF SATURATED LIQUID @ NBP (LB/FT ³)	74.3	70.5
SPECIFIC HEAT OF SATURATED VAPOR AT NBP (BTU/LB °R)	0.14	0.19
SPECIFIC HEAT OF SATURATED LIQUID AT 77°F (BTU/LB °R)	0.30	0.36
OZONE DEPLETION POTENTIAL (ODP) (CFC-11 = 1)	0.055	0
GLOBAL WARMING POTENTIAL (GWP) (100-YR)	1,810	2,138
ASHRAE SAFETY GROUP CLASSIFICATION	A1	A1
OCCUPATIONAL EXPOSURE LIMITS (8 HR TIME/WT. AVG.) (PPM)	1,000	1,000

MEDIUM TEMPERATURE RACK (4 COMPRESSORS)	R-22	R-427A
AVERAGE CASE TEMPERATURE (°F)	38	38
DISCHARGE PRESSURE (PSIG)	180	180
SUCTION PRESSURE (PSIG)	42	36
AVERAGE DISCHARGE TEMPERATURE (°F)	175	160
AVERAGE SUCTION TEMPERATURE	39	37

COMPRESSORS OPERATING (4 COMPRESSORS)	R-22	R-427A
KW/HOUR	29.2	27.1
TOTAL MONTHLY COST (ASSUMING \$0.06/KW)	\$1,262	\$1,171

7% REDUCTION IN OPERATING COST

For answers to your refrigerant related questions or retrofit concerns, please contact Arkema's Technical Service Team at (800) 738-7695. More information on R-427A and our other retrofit solutions is available through our website, r22retrofits.com.

Technical Service Team: (800) 738-7695
forane.com

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