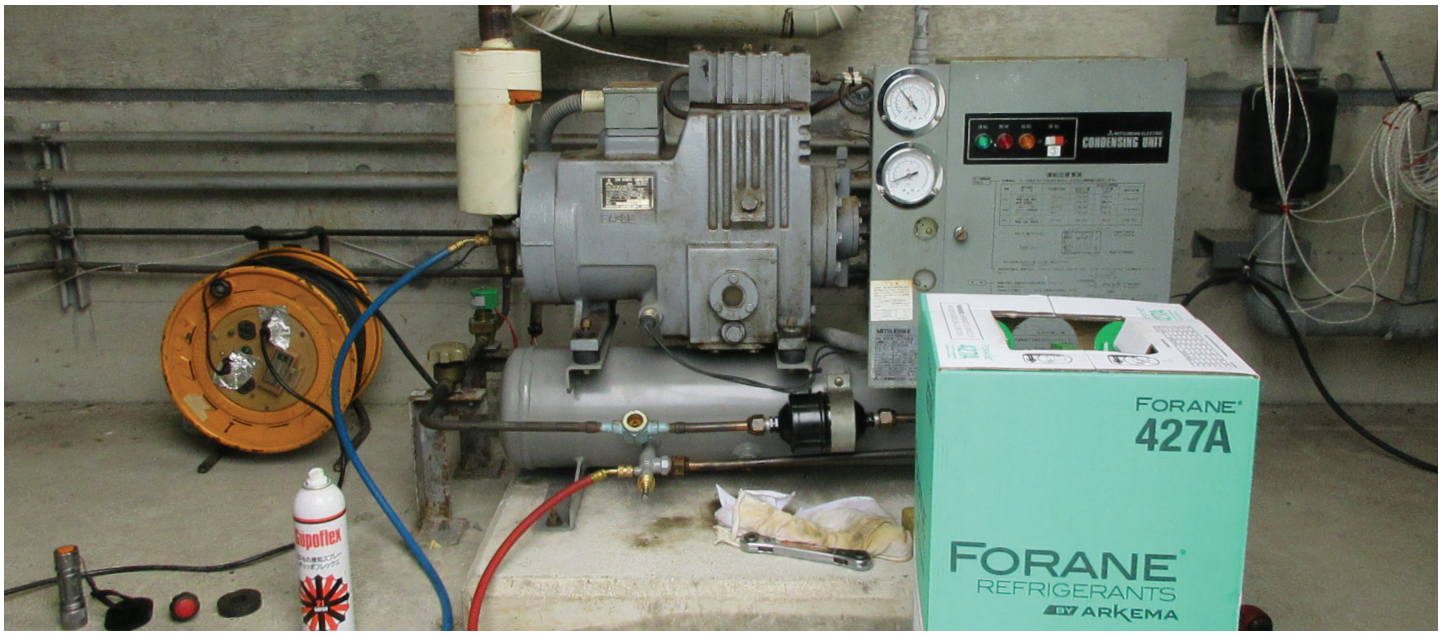
FORANE® REFRIGERANTS BY ARKEMA

CASE STUDY

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

Chemical Storage Warehouse, Yoshitomi, Japan



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, easy-to-use, non-ozone depleting HFC refrigerant for air conditioning, heat pump, and refrigeration applications. Developed in 2005 as a solution to Europe's R-22 phase out time line, Forane® 427A refrigerant – The Easy Retrofit™ is a better match to R-22 than other retrofits over a wide range of applications, offering close capacity and pressures to R-22, with no oil change required in many installations.

The transition away from R-22 is continuing around the world, and equipment owners will need to make a choice. Purchase new equipment, continuing running on R-22, or retrofit the equipment to an HFC refrigerant, such as Forane® 427A – The Easy Retrofit™. There are several HFC retrofit refrigerants available. All are a blend of some combination of four component refrigerants: R-32, R-125, R-134a, and R-143A.

RETROFIT APPLICATION

In October 2018, the owners of a chemical storage warehouse in Yoshitomi, Japan, needed to make a decision to replace, repair, or retrofit a walk-in cooler, which stored organic peroxide. The system was 28 years old, and future service could get costly with the phase out of R-22. After considering all the options, the owners chose to retrofit the system with Forane® 427A refrigerant.

The walk-in cooler was 4,500 cm x 2,000 cm x 2,400 cm, and the design temperature was –10°C (14°F). The condensing unit was relatively close to the evaporator. Although an oil change isn't necessary in many instances, Arkema's technical support team recommended an oil change due to the low evaporator temperature. The unit was checked for leaks. Necessary repairs were made, and a new filter dryer was installed. The owners requested more detailed run information; therefore, the system was outfitted with temperature sensors and pressure transducers at four locations, in order to record running conditions. After several hours of run time, the data showed all pressure and temperatures to be in line with the manufacturer's R-22 run specifications. The system has been running well for over a year now.

Project
Chemical Storage Warehouse

Location
Yoshitomi, Japan

Application
Refrigeration

Refrigerant
Forane® 427A (R-427A)

Lubricant
POE Oil

CLASSIFIED UL®

RESULTS

The retrofit exceeded expectations, with the data proving Forane® 427A – The Easy Retrofit™ had very similar performance to R-22. The pull down time to achieve – 10° C was 9% faster than R-22, and the system showed no difficulty in maintaining the correct temperature. The owners were very satisfied and are planning to covert larger R-22 systems over to Forane® 427A – The Easy Retrofit™ in the future. Forane® 427A – The Easy Retrofit™ – was developed in the early 2000s and made commercially available in 2005. Globally, many air conditioning and refrigeration systems have been retrofitted with R-427A over the last 15 years. Forane® 427A is a proven choice and provides one of the best solutions for owners, who will eventually need to decide whether to replace or retrofit their R-22 equipment.

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, www.r22retrofits.com.

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)	1,760	2,024
ASHRAE Safety Group Classification	A1	A1
Occupational Exposure Limits (8 hr time/wt. Avg.) (ppm)	1,000	1,000

TABLE 2

COOLING PERFORMANCE COMPARISON	R-22	R-427A	REMARKS
Charge Volume (kg)	10.5	10	
Epansion Device	TXV	TXV	Remain Unchanged
Lubricant	Suniso 3GSD	FVC46D	
Warehouse Temperature	-10°C	-10°C	
Discharge Temperature	115 ~ 130°C	100 ~ 110°C	
Time to Reach Set Temperature	1.00	0.91	Relative Ratio When Set R-22 at 1
Running Amps	1.0	0.87	

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ARKEMA
INNOVATIVE CHEMISTRY

Arkema K.K.
Fukoku Seimei Bldg. 15F
2-2-2 Uchisaiwaicho chiyoda-ku, Tokyo
100-0011, Japan
Tel: +81 3 5251 9597
www.arkema.co.jp

Arkema Inc. (Americas)
900 First Avenue
King of Prussia, PA 19406
Tel.: +1 610 205 7000
Fax: +1 610 205 7497
arkema-americas.com

Headquarters: Arkema France
420, rue d'Estienne d'Orves
92705 Colombes Cedex – France
Tel.: +33 1 49 00 80 80
Fax: +33 1 49 00 83 96
arkema.com

forane.com