

# Arkema's Forane<sup>®</sup> 427A Refrigerant – The Easy Retrofit™

## Kazema Supply & Parts KSCC, Kuwait



### BACKGROUND

As the HVACR industry continues to move away from R-22 due to regulatory pressures, Arkema's Forane<sup>®</sup> 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. Forane<sup>®</sup> 427A refrigerant 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.

Kuwait City is located in a desert climate, where summer temperatures regularly exceed 45°C (113°F), and temperatures over 52°C (126°F) are not uncommon. Air-conditioning and refrigeration are not luxuries but necessities there. As an Article 5 country, Kuwait is following the phase-out of R-22, according to the timeline set forth by the Montreal Protocol. Its allocation of this refrigerant is scheduled to drop to 65% of the baseline in 2020. Thus, there is a growing need for an R-22 retrofit refrigerant that is both environmentally friendly and can perform in a hot desert climate.

Kazema Supply and Parts KSCC is a leading HVACR distributor serving three countries – Kuwait, Bahrain, and Qatar. Headquartered in Kuwait City, they have twelve sales outlets locations. Senior management at Kazema was planning to transition their customers away from R-22 but was concerned as to what retrofit refrigerant would perform well in their high ambient temperature environment.

### RETROFIT APPLICATION

Based on the performance characteristics, such as capacity, COP, pressures, and discharge temperature, Forane<sup>®</sup> 427A – The Easy Retrofit™ – was a better match to R-22 than other retrofits, over a wide range of applications. To confirm these characteristics, Kazema agreed to a retrofit trial, with live testing in Kuwait. In the summer of 2018, Arkema retrofitted two units from R-22 to Forane<sup>®</sup> 427A – The Easy Retrofit™. The first was an 8-ton Goodman rooftop package unit, cooling a (72 sq. meter) Kazema distribution and showroom. The second was a 3.5-ton ducted split system, cooling two (60 – 65 sq. meter) apartments. The mineral oil was not changed in either systems, since the distance from the compressor to the evaporators was relatively close with only minimal elevation change (< 2 meters). The results of the trial are recorded in table 2 (on back).

### Project

Kazema Supply & Parts KSCC

### Location

Kuwait City, Kuwait

### Application

Air Conditioning (AC)

### Refrigerant

Forane<sup>®</sup> 427A (R-427A)

### Lubricant

Mineral Oil (MO)



## RESULTS

Both units continue to operate with no noticeable difference in cooling with Forane® 427A – The Easy Retrofit™. As expected, discharge pressures were elevated with R-22 and still elevated with R-427A, due to the high ambient and dusty conditions. Once the condensers were cleaned, discharge pressures reduced to a more manageable level. Suction pressures and discharge temperatures were lower with R-427A, as expected. The temperature in Kuwait during the retrofit exceeded 51°C. The return air temperature versus air supply temperature exceeded 17°C (30°F) for some parts of the day during the retrofit, which shows the challenging conditions.

In use since 2005, Forane® 427A – The Easy Retrofit™ – is a proven R-22 retrofit option, in both temperate and high ambient temperature climates as well as many different applications. As the availability of virgin R-22 becomes more difficult to obtain, users in the Middle East will continue to look for affordable and sustainable options available, like Forane® 427A – The Easy Retrofit™.

For answers to your refrigerant related questions or retrofit concerns, please contact Arkema's Technical Service Team at [info.forane@arkema.com](mailto:info.forane@arkema.com). More information on R-427A and our other retrofit solutions is available through our website, [www.r22retrofits.com](http://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/ft³)	0.29	0.30
Density of Saturated Liquid @ NBP (lb/ft³)	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

RETROFIT RESULTS	R-22	R-427A
Ambient	52	52
Head Pressure	309	319
Suction Pressure	104	100
Discharge Temperature	133	111
Suction Temperature	52	46
Supply Air	21	21
Return Air	26	26

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