

CASE STUDY

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

Giorgio Mushroom Company, Temple, PA

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. Forane[®] 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.

Giorgio Mushroom Company is a very large mushroom producer in Temple, PA. They have been in the business since 1928, growing and packaging a variety of mushrooms. Mushroom growing is a science with many critical variables, from mixing the correct proportion of compost to maintaining a strict temperature range so that the mushrooms can thrive in a healthy environment. Giorgio maintains hundreds of grow houses, each requiring its own air-conditioning system. Heat generated from the composting necessitates air conditioning of these grow houses year-round. The grow houses typically use custom modified package air-conditioning units, where the systems are exposed to extreme environmental conditions. Outside ambient temperatures in Temple, PA, can exceed 100°F in the summer and go below -10°F in the winter. The inside temperature must be maintained below 60°F.

RETROFIT APPLICATION

In 2011, Giorgio's engineering team started seeking a more environmentally friendly refrigerant. Care had to be taken, as the systems do not have the extra capacity, especially on high ambient days, and had to be similar to R-22 in efficiency. After careful review and testing, Forane[®] 427A was the only refrigerant that could perform like R-22 in this environment. They changed the oil to POE in some systems, while other systems remained on mineral oil.



PROJECT

Giorgio Mushroom Company

LOCATION

Temple, PA

APPLICATION

**Industrial Air Conditioning (AC) –
Extreme Ambients**

REFRIGERANT

Forane[®] 427A (R-427A)

LUBRICANT

Mineral Oil (MO) and POE



RESULTS

Forane® 427A refrigerant performed like R-22 in both high ambient conditions and low ambient weather. The engineering team continues to retrofit R-22 systems needing maintenance, extending the life of the systems. In some cases Forane® 427A refrigerant is delivering lower supply air temperature while consuming the same amount of power. These systems again illustrate the performance of Forane® 427A refrigerant in harsh conditions where R-22 was the only refrigerant that was used. Forane® 427A refrigerant offers similar performance to R-22, at a reduced cost, without the environmental concern of ozone depletion. A comparison can be seen in Table 1.

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.

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 |

| FORANE® REFRIGERANT 10-T PACKAGED UNIT | R-22 | R-427A |
|--|------|--------|
| AMP DRAW (AMP) | 30.3 | 30.4 |
| SUCTION PRESSURE (PSIG) | 52 | 49 |
| INSIDE ROOM TEMPERATURE (°F) | 60 | 57 |
| AMBIENT TEMPERATURE (°F) | 52 | 52 |
| TEMP DIFFERENCE ACROSS (°R) EVAPORATOR | 9.3 | 10.7 |

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

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