

# SERVICE AND APPLICATION NOTES

October 24, 2003  
Revised March 21, 2012  
C-03-2

## Alternate Refrigerant Evaluation — Hydrochlorofluorocarbon HCFC-22 (R-22) Drop-in Replacements

Lennox periodically receives requests to evaluate refrigerant replacements for HCFC-22 in residential systems. Lennox Residential Engineering has conducted studies of the available alternate HCFC-22 refrigerants and would like to provide you with the **most current information** and our recommendations regarding their use in Lennox equipment.

At this time, **Lennox does not recommend the use of the listed alternate refrigerants (table 2) as replacements for HCFC-22 in new or existing field systems due to the concerns listed below and the lack of endorsement by our compressor suppliers.**

### PRODUCT COMPOSITION:

Table 1. HCFC-22 Refrigerant (Hydrochlorofluorocarbon)

Refrigerant	ASHRAE 34 Class	Glide (°F)	Oil	GWP (AR4 Value)	ODP	Refrigerant Blend	HFC Component (Weight %)
HCFC-22	A1	0	Mineral	1700	0.05	22	100

Table 2. Non-Compatible Refrigerants (Hydrofluorocarbon)

Refrigerant	ASHRAE 34 Class	Glide (°F)	Oil	GWP (AR4 Value)	ODP	Refrigerant Blend	HFC Component (Weight %)
R-407C (AC9000, KLEA-66)	A1	9	POE	1700	0	32/125/134a	23/25/52
R-417A (NU-22, Isceon MO59)	A1	7	POE	1950	0	125/134a/600	46.6/50/3.4
R-422B (NU22B)	A1	5	POE	2526	0	125/134a/600a	55/42/3
R-438A (Isceon MO99)	A1	7	POE	2264	0	32/134a/600/601a	8.5/45/44.2/1.7/0.6

1. All HCFC-22 retrofits are based on two or more of the four basic hydrofluorocarbons (HFCs) — R-32, R-125, R-143a and R-134a.
2. Many HCFC-22 retrofits contain additives – hydrocarbons (HCs) or lubricants used to improve mineral oil (MO) solubility.
3. All retrofits are blends and must be charged as a liquid.

### ASHRAE CLASSIFICATION:

ASHRAE has classified this product as A1. This classification is a summary of the toxicity and flammability characteristics as defined in ASHRAE Standard 34.



## **UNDERWRITERS LABORATORIES (UL) CLASSIFICATION:**

Current compressors used in HCFC-22 systems by Lennox are not UL recognized for use with alternate refrigerants referenced in table 2. Retrofitting units with any of the the refrigerants reference in table 2 could have an impact on the UL approval.

### **Performance Concerns:**

System capacity, Energy Efficiency Rating (EER) and Co-Efficient of Performance (COP) will be lower with these refrigerants. Many HCFC-22 retrofits require higher mass refrigerant flows to provide the same cooling capacity plus the refrigerants have higher glide values that may lead to replacement of components such as expansion valves. These differences can result in lower system capacities that could result in longer run times or capacity-critical systems failing to meet load requirements, especially at higher ambient temperatures.

### **Lubricant Compatibility Concerns:**

HFC refrigerants will not mix with 100% mineral oil. In retrofitting existing systems to an HFC it will be necessary to add some percentage of Polyolester (POE) oil to improve the miscibility of the oil with the HFC. The risks of accurately adding POE to systems in the field is under investigation at this time.

In addition to the question of mixing, there are concerns over the chemical reactivity of POEs in the presence of residual oils and containminants left in the system. POEs are better solvents than previous lubricants and systems with residue on the inside of piping or components may be **cleaned** by the POE, which will now circulate the impurities to the valves and/or compressor.

### **Lubricant Compatibility Concerns:**

Rubber seals or gaskets which worked well with HCFCs may be a problem with HFCs or POE oils. These new fluids may soak into the rubber (or leach out material from the rubber) and cause the seal to swell (or shrink) out of the gap to be sealed. This may lead to a leak developing several weeks after completion of the retrofit. Compatibility of existing system components with POE oil is under investigation.

### **Installation Concerns:**

1. Alternate refrigerants are blends with a high glide and therefore can result in difficulties in establishing the proper charge during installation. (Subcooling values)
2. System charge may vary significantly from original HCFC-22 factory charge. R-417A testing showed the need for a 20% increase in refrigerant charge.
3. Any severe leakage and subsequent recharge can result in a blend composition change which will lead to further degradation of system capacity.
4. In order to maximize the performance, eliminate the potential for flood back and to obtain system capacities as close to HCFC-22 as possible the factory HCFC-22 TXV will need to be replaced. (Superheat values)
5. The use of alternate refrigerants in systems containing mineral oil lubricants has been questioned and at present is not recommended based on the need for further long term studies on the miscibility of oil and oil return considerations. Therefore it has been strongly recommended the industry use only POE oils with HFC alternate refrigerants.

### **WARRANTY:**

Field application of these alternate refrigerants is considered an unauthorized modification of Lennox equipment and will **void the product warranty per the terms of our warranty policy.**

**Note:** This service and application note will be updated with new findings or other alternate refrigerants as further research is completed.