

R-438A (MO-99) vs. R-427A as R-22 Retrofit Alternatives:

This short informational brochure compares two of the leading R-22 alternatives and focuses on dispelling misinformation.

Performance: Capacity and efficiency after a retrofit.

The most important aspect of a replacement is whether it can do the job of R-22 well enough or not. "Well enough" here means that the retrofit labor is relatively simple and the performance of the equipment after the retrofit is close in capacity and efficiency to that of the original set up. For all alternative refrigerants, none will work as well as R-22 on a R-22 system. Owners should expect capacity and efficiency losses that will vary in magnitude, depending on the ambient conditions and equipment. They will need to decide if the following average losses in A/C, for example, are acceptable:

	Capacity Loss	Efficiency Loss
R-438A	1.7%	9.1%
R-427A	1.5%	7.1%

FACT: Capacity and efficiency losses are inevitable and will occur after a retrofit. The magnitude of the losses will depend on running conditions and the equipment itself.

Mineral Oil Compatibility: Need to flush the mineral oil.

Replacement of the original oil in a system is not easy, and, in some cases, it can be time consuming and labor intensive. However, if an oil change is not done when it is needed, the retrofit can be even costlier. R-22 systems were filled with either mineral oil or alkyl benzene oil because these oils were soluble with R-22. POE oils also would have been miscible, but their added cost was unnecessary. R-438A and R-427A are both HFC refrigerants and, thus, do not have great affinity for mineral oil. However, in simpler systems or in systems with oil separators, the refrigerant will push around enough oil to lubricate the compressor.

Even in cases when oil circulation may be sufficient to lubricate the compressor, its accumulation in certain areas, such as in the evaporator, will have a detrimental effect on performance by significantly reducing the effective area of the evaporator.

FACT: The best oil for an R-22 replacement is POE. While some systems may operate for some time, or even indefinitely, using mineral oil, there are risks associated with doing so, related either to compressor life or system performance.

Discharge Temperatures: Cooler discharge temperatures may mean no need for liquid cooling.

One of the disadvantages of using R-22, especially at low temperatures, is that it has very high discharge temperatures. This means that many systems have oil operating at the upper limits of its temperature range, which is not advisable since it could degrade or not lubricate as well. The issue was solved in many systems by using liquid injection. However, the trade-off of liquid injection is a small reduction in the system's capacity and efficiency. R-438A and R-427A run at significantly lower discharge temperatures. In some cases, the temperatures are such that liquid injection is not needed. Of course, this can result in a gain of capacity and efficiency, which, in some cases, would bring the retrofitted systems to a level of performance comparable to those of the original R-22 system.

FACT: Some small improvements in system performance over R-22 are possible in special cases involving liquid injection, but this is not the norm.

Only One Refrigerant Needed: One R-22 replacement will work the best in all applications.

R-22 is an incredibly versatile refrigerant, used in applications from A/C to refrigeration. Equipment designed to use R-22 has been fine-tuned to its properties for each application. Any other refrigerant used will not *behave* the same and, more importantly, will not *perform* the same. Some refrigerants, such as R-407C, were optimized for A/C, while others, such as R-407A, were optimized for refrigeration. While it is possible to use just one refrigerant in all applications, a compromise is being made in the sense that the system will operate but may not be at its best under all required conditions.

FACT: Claiming that one refrigerant fits all applications equally as the original refrigerant is inaccurate and misleading. Certain refrigerants fit certain applications better, and using them in other applications results in potentially significant compromises.

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