

R-438A

R-438A is an R-22 retrofit refrigerant blend consisting of R-32/ R-125/R-134a/R-600/R-601a. The weight percentages of the five components are 8.5/45.0/44.2/1.7/ 0.6 respectively. R-600 is the hydrocarbon (HC) butane and R-601a is the hydrocarbon isopentane. These two hydrocarbons constitute a very small percentage of the total blend (1.7 percent and 0.6 percent) respectively, but this small amount helps thin the mineral oil so it has a lower viscosity, enhancing oil return to the compressor's crankcase.

This characteristic was intentionally designed into the blend to achieve mineral oil compatibility, which many other retrofit blends lack. Because of the small percentages of these two hydrocarbons, R-438A is not flammable. Its ASHRAE safety group classification is A1. R-438A is versatile and can be used for retrofitting R-22 direct expansion systems in air conditioning (high-temperature) applications and medium- and low-temperature refrigeration applications. R-438A is Significant New Alternatives Program- (SNAP-) approved for sale in the United States.

The evaporator and condenser temperature glide is typically in the 6° to 7°F range. R-438A, as well as most refrigerant blends, is not recommended for use in systems with a flooded evaporator or a centrifugal compressor, as the vapor/liquid composition difference associated with the temperature glide may inversely impact performance.

ODP AND GWP

R-438A has a zero ozone depletion potential (ODP). Its global warming potential (GWP) is 1,890 according to the Second Annual Report of the European Commission. The GWP, according to the Fourth Assessment Report (AR4) of the United Nations Intergovernmental Panel on Climate Change, is 2,264.

R-438A has similar pressure and enthalpy characteristics compared to R-22 in low-, medium-, and air conditioning applications. It is compatible with mineral oil, alkylbenzene, and polyolester (POE) through all of the above-mentioned temperature ranges.

For most systems, R-438A may have 5 to 10 percent lower capacities with similar EER when compared to R-22. Because most R-22 systems in service today have excess compressor capacity, this small percentage in capacity loss will not be significant.

The compressor simply runs a small amount longer each cycle. The mass flow R-438A is only slightly higher than R-22 to achieve the same refrigeration capacity, so existing TXVs can be used with minimal adjustment to the superheat setting.

ADVANTAGES

R-438A can be used as a retrofit refrigerant blend in air conditioning and refrigeration applications with minimal system changes. Some advantages of using R-438A in most

R-22 system retrofits are:

- No expansion valve or expansion valve power element change;
- No suction or liquid line set changes;
- No oil changes - is compatible with mineral oil, alkylbenzene, and POE oil;
- Nondisruptive, meaning no strainer plugging especially with TXVs and evaporator pressure regulator valves;
- Needs a filter drier change, but can use a standard filter drier;
- Minimal set point adjustments, if any;
- Only a 3- to 6-psi head pressure difference when compared to R-22;
- Only a 2- to 3-psi evaporator pressure difference when compared to R-22;
- Comparable energy consumption when compared to R-22;
- In refrigeration retrofits, R-438A has a very low carbon footprint. Its GWP is 42 percent lower than R-404A; and
- A very low first-cost retrofit in a/c and refrigeration applications.

Note: When retrofitting R-22 systems to R-438A, or any HFC refrigerant, it is recommended that critical elastomeric seals such as Schrader valves and liquid level indicators be changed.