Cool55™

(ASHRAE R-434A)
An easier R-22 Alternative

Coolgas
refrigerants made simple™

Introduction

Cool55™ is a zero ozone depletion potential (ODP) refrigerant, which along with Cool50™ (ASHRAE R-424A), is designed to replace R-22 in air conditioning or refrigeration systems originally intended to be used with R-22. In a properly retrofitted R-22 system, Cool55™'s performance and operating conditions will be very close to those of R-22.
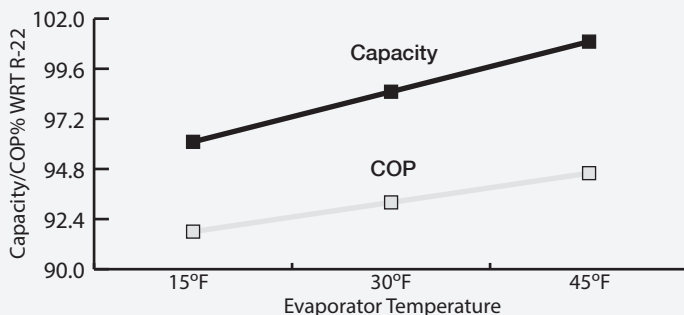
Cool55™ offers a number of unique features that positions it at the top of the extensive group of R-22 alternatives. These features include similar cooling capacity and efficiency, similar thermodynamic properties, very low evaporator glide and good miscibility with the mineral and alkyl benzene oils typically used in R-22 systems.

Similar Operating Conditions

System controls, such as cut-in/cut-outs and thermal expansion valves (TXV), modify the behavior of a refrigeration or air conditioning system based on the pressure/temperature relationship of the refrigerant in use. While some small differences are expected based on the use of a different refrigerant, they need to be relatively small so only minor or no modifications are needed. Dealing with large operating condition differences would require significant and labor intensive modifications to a system. Cool55™ avoids that cost.

Cool55™ maintains similar mass flow rates, suction temperatures, and suction and discharge pressures. In addition, it exhibits a slightly lower compressor discharge temperature, especially at lower evaporator conditions, as compared to R-22. This helps with compressor durability and lubricant oil life.

Some of the benefits of Cool55™ are:

- Very similar performance in capacity and efficiency to that of R-22 in R-22 equipment

- Close operating conditions

- Compatible with mineral and alkyl benzene oils in addition to POE oils

- Very low evaporator glide

- Safe, rated A1 by ASHRAE standard 34

- Similar thermodynamic properties to R-22

Similar Performance

R-22 equipment was designed and optimized to work with R-22. Its use with any other refrigerant implies that its performance will not be as optimized. Cool55™ has very similar capacities and efficiencies to those seen with R-22 in the same equipment making it particularly suitable for the application. A seen in the graphics, use of Cool55™ will preserve system performance compared to R-22 while providing for a simple retrofit.

No R-22 alternative will provide for an exact match, but Cool55™ comes close to that goal while keeping the retrofitting procedure simple.

Performance of Cool55™ with respect to R-22 vs. evaporator temp, at 105°F condenser and 10°F SC and SH. Standard cycle*.

Physical Properties		Cool55™	R-22
Molecular Weight	--	105.3	86.5
ODP	--	0	0.055
Critical Pressure	psia	570	724
Critical Temperature	°F	172.1	204.8
Normal boiling point (at 1 atm)	°F	-48.8	-41.4
Glide	°R	3	0
Liq. Density at (77°F) 25°C	lb/ft^3	68.42	74.35
Vapor Density at (77°F) 25°C	lb/ft^3	3.31	2.76
Vapor Pressure at (77°F) 25°C	psia	163	151
Flammability Limits	--	none	none
Inhalation Exp LImits (8 hr day/40 hr week)	ppm	1000	1000

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Mineral Oil Compatibility

Most R-22 systems are used with either mineral or alkyl benzene lubricant oils, which unfortunately are not fully miscible with HFCs. Cool55™ uses a simple technique to help with this, the addition of a small amount of hydrocarbons (HC) to the main HFCs, to achieve a greater miscibility with these oils. This will ensure that most systems will be able to operate without the need for an oil change. However, for systems with questionable oil return or to maximize performance, an oil change to a POE oil may be recommended. Check with your system's manufacturer for specific recommendations.

Very Low Glide

R-22 is a single component refrigerant, which of course has no glide at the heat exchangers. Most of the so called "easy retrofit" refrigerants have a large glide that makes them unsuitable for many applications, in particular systems with flooded evaporators. Cool55™'s low glide at just 3°F (compared to R-407A's at close to 9°F) offers a versatile and simple option to retrofit flooded evaporator systems that is unique in the retrofit market. Be careful with data regarding glide, since its value depends on several factors including condenser and evaporator temperatures and there is no standard condition for reporting it.

Safety

Cool55™ has been assigned a rating of A1 by ASHRAE indicating that it is considered to be non-flammable and non-toxic, just like R-22. However, only qualified and trained technicians should handle this and any other refrigerant. Consult Cool55™'s MSDS on our web site for more safety information.

Contact us

If you are ready to begin retrofitting and would like to try Cool55™ for yourself, please contact us at Coolgas for pricing information. If you still have questions, please send us an email to askgus@coolgas.com and a member of our technical staff will contact you to assist you.

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Pressure/Temperature Saturation Data*

| Temperature | | Pressure | | |
| in °F | in °C | R-22 | R-434A | |
			Liq.	Vap.
-40	-40	0.6	3.9	1.7
-35	-37.2	2.6	6.3	4
-30	-34.4	4.9	9	6.5
-25	-31.7	7.4	12	9.3
-20	-28.9	10.2	15.3	12.3
-15	-26.1	13.2	18.8	15.7
-10	-23.3	16.5	22.7	19.3
-5	-20.6	20.1	26.9	23.3
0	-17.8	24	31.4	27.6
5	-15	28.3	36.3	32.3
10	-12.2	32.8	41.6	37.4
15	-9.4	37.8	47.3	42.9
20	-6.7	43.1	53.4	48.8
25	-3.9	48.8	60	55.1
30	-1.1	55	67.1	61.9
35	1.7	61.5	74.6	69.2
40	4.4	68.6	82.6	77
45	7.2	76.1	91.2	85.4
50	10	84.1	100.4	94.3
55	12.8	92.6	110.1	103.8
60	15.6	101.6	120.4	113.9
65	18.3	111.3	131.3	124.6
70	21.1	121.4	142.9	135.9
75	23.9	132.2	155.1	148
80	26.7	143.6	168	160.7
85	29.4	155.7	181.7	174.2
90	32.2	168.4	196.1	188.5
95	35	181.8	211.3	203.5
100	37.8	195.9	227.3	219.4
105	40.6	210.8	244.1	236.1
110	43.3	226.4	261.8	253.7
115	46.1	242.8	280.4	272.2
120	48.9	260	299.9	291.7
125	51.7	278	320.4	312.3
130	54.4	296.9	341.9	333.8
135	57.2	316.7	364.4	356.5
140	60	337.4	388.1	380.4
145	62.8	359	412.9	405.5
150	65.6	381.7	438.9	432

Pressures are in psig, except for the red numerals which are in inches of Hg below 1 ATM
*Data Generated using CycleD and REFPROP by NIST

Glide Comparison

Refrigerant	Glide in °F
R-22	0
Cool55™	3
R-407A	8.5
R-407C	9.4
R-427A	8.7
R-422D	5.4
R-438A	7.9