

19/10/16

EXTENDING THE LIFE OF RS-45 (R434A) BEYOND 2020

In 2020, the F Gas regulation in the European Union prohibits the sale of refrigerants with GWP greater than 2,500. RS-45 (R434A), which is currently the only known suitable retrofit option for R22 in flooded systems, falls within this category & so will not be permitted for sale beyond this date, in the EU at least.

However, RSL has another refrigerant, called RS-90, which can be added to RS-45 without any technical issues due to the fact that the components in both of these refrigerants are the same, so that the lifetime of the plant can be extended for many years thereafter (eg 10 years) depending upon the rate of annual leakage of refrigerant from the plant.

Key points:

- (1) If after adding RS-90 to an installation already operating on RS-45 (R434A), a resultant composition contains RS-45 & RS-90 in equal proportions (ie a 50/50 mixture), this mixture still has a capacity within 7% of RS-45 (R434A).
- (2) If leakage of RS-45 (R434A) occurs at 10% pa over a 5-year period, capacity of the mixture at the end of this period is still within 5% of RS-45 (R434A). After 7 years' leakage at this rate, capacity of the remaining mixture is within 7% of RS-45 (R434A).
- (3) If leakage of RS-45 (R434A) occurs at 20% pa over a 5-year period, capacity of the mixture at the end of this period is within 8% of RS-45 (R434A). After 7 years' leakage at this rate, capacity of the remaining mixture is still within 10% of RS-45 (R434A).
- (4) In practice, leakage rates should be well below 10% pa.
- (5) Adding RS-90 to an installation containing RS-45 (R434A) can, therefore, extend the life of the plant by approx. another 10 years or so.
- (6) The components of RS-90 are identical to those in RS-45 (R434A) so that there are no technical issues around the blending of these two refrigerants.
- (7) The attached table provides the details in support of these conclusions.

RS-45 & RS-90 MIXTURE 50/50

Open compressor		RS-45/90			
Evap +7C	Cond +45C	R22	R434A	RS-90	50/50
Discharge pressure	bar	17.29	19.54	16.06	17.72
Discharge temperature	deg C	73.50	57.20	58.7	58.1
Capacity	kJ/m ³	3732	3632	3155	3392
% of R434A				86.9	93.4
COP		4.96	4.56	4.76	4.67
Compression ratio		2.78	2.79	2.93	2.86
Glide (evaporator)	K	0.0	1.4	2.7	2.3
Flow rate	kg/(s.kW)x 1	6.18	9.10	7.78	8.36
GWP		1830	3245	2481	

10% PA LEAK

Years

Evap +7C		Cond +45C		1	2	3	4	5	6	7
Discharge pressure	bar	19.16	18.83	18.53	18.27	18.03	17.83	17.64		
Discharge temperature	deg C	57.40	57.50	57.7	57.8	57.90	58.0	58.1		
Capacity	kJ/m ³	3584	3541	3502	3467	3436	3407	3382		
% of R434A				98.7	97.5	96.4	95.5	94.6	93.8	93.1
COP		4.58	4.60	4.62	4.64	4.65	4.66	4.67		
Compression ratio		2.81	2.82	2.83	2.84	2.85	2.86	2.87		
Glide (evaporator)	K	1.6	1.8	2.0	2.1	2.2	2.3	2.3		
Flow rate	kg/(s.kW)x 1	8.94	8.80	8.68	8.58	8.49	8.41	8.34		

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Glide (evaporator)	K	0.0	1.4	2.7	2.3
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GWP		1830	3245	2481	

20% PA LEAK

Years

Evap +7C		Cond +45C		1	2	3	4	5	6	7
Discharge pressure	bar	18.79	18.21	17.76	17.41	17.13	16.91	16.74		
Discharge temperature	deg C	57.60	57.80	58.1	58.2	58.30	58.4	58.5		
Capacity	kJ/m ³	3536	3459	3398	3349	3310	3279	3254		
% of R434A				97.4	95.2	93.6	92.2	91.1	90.3	89.6
COP		4.60	4.64	4.67	4.68	4.70	4.71	4.72		
Compression ratio		2.82	2.84	2.86	2.87	2.89	2.89	2.90		
Glide (evaporator)	K	1.8	2.1	2.3	2.4	2.5	2.6	2.6		
Flow rate	kg/(s.kW)x 1	8.79	8.56	8.38	8.25	8.15	8.07	8.01		