climalife®

R22 REPLACEMENT FOR EXISTING A/C EQUIPMENT

With the ban on using R22 for topping up systems looming in just over 6 months, Peter Dinnage of Climalife considers the alternatives if the equipment is not to be replaced.

There is a very strong argument that the vast majority of air conditioning equipment still running on R22 is old and, therefore, should be replaced.

With R22 banned from use in all new equipment back in 2004, it is fair to assume most equipment is more than 10 years old. With the advances of new equipment to work better and much more efficiently, you would think by now, the vast majority of R22 equipment would have been replaced. However, equipment manufacturers are still reporting that 40-50% of AC equipment in the market is still on R22. The exact accuracy of the figure is probably immaterial as it suggests there remains a large amount of equipment still reliant on R22. It was always perceived that the 5 years between the ban on virgin product and the final use ban would allow for an orderly transition away from R22, but the economic climate has meant replacement has been slow. Supply of new equipment is likely to be in great demand and much of the equipment not replaced is likely to be converted to another refrigerant.

The Merits of R438A

Converting existing AC equipment still on R22 to another refrigerant can be relatively straightforward for those who are either experienced at doing such conversions or as long as they follow the relevant conversion guidelines. Over the last 15 years, large numbers of R22 equipment have been successfully converted across Europe. Originally R417A (ISCEON® MO59) and R422D (ISCEON® MO29) were used extensively, but R438A (ISCEON® MO99) can work in the applications in which the other two are used, meaning therefore that only one refrigerant is required.

R438A is equally suited to replace R22 in split AC, package units, Variable Flow (VRF) systems, water chillers, close control data centre cooling as well as refrigeration applications.

In split systems with hermetic compressors, no oil drain and a capillary tube, only a very simple refrigerant change is possible where the existing oil can be used. ISCEON® MO99 is therefore the best solution as minimal changes are required to effect the conversion.

It is recommended the elastomeric seals, such as the valve cores and caps, are changed to prevent leaks but any Teflon or nylon rings do not need to be changed. Where expansion valves are fitted they may need a slight adjustment and fitting a new filter dryer is good practice.

As with all conversions, it is recommended to read and follow the manufacturer's conversion guidelines, have the pressure tables to hand or at least a refrigerant comparator or a mobile phone. More importantly, before starting, make sure the AC unit is working properly and record the operating conditions prior to conversion, so they may be compared post conversion.

Use of R438A in the UK

The operating ambient temperatures in the UK should present no problems to ISCEON® MO99 (R438A) as residential AC units in Phoenix, Arizona have been converted where the outside air temperature is regularly over 40°C. In 2012, one contractor alone converted over 50 units to ISCEON® MO99 (R438A) without problems or call backs on any of them.

ISCEON® MO99 (R438A) has been in widespread use in the UK since 2009 with plenty of satisfied customers in a range of application.

BT have converted some of their datacentres from R22 to ISCEON® MO99 where close control AC systems protect critical servers and data rooms. The initial trial took place at their West London site on a 17 year old 74kW system before the other 10 systems were also converted. It was important that changes in cooling performance and efficiency were kept to a minimum and this was achieved as the contractor, Temperature Control Ltd, used a simple tried and tested conversion procedure that they have used for the last 5-7 years.

Other applications such as Variable Flow AC systems have also been converted to ISCEON MO99. Typical operating conditions of ISCEON MO99 can be seen compared to R22 in table 1, which are very close to R22 on important parameters.

REFRIGERANT		R22	R438A ISCEON® MO99	R422D ISCEON® MO29	R417A ISCEON® MO59
Mean Evaporating Temperature	°C	5	5	5	5
Evaporating Pressure	bar.g	4.828	4.649	4.948	4.061
Evaporator Super Heat	K	5	5	5	5
Suction Line Superheat	K	5	5	5	5
Compressor Suction Temperature	°C	15	17.1	16.4	16.5
Compressor Discharge Temperature	°C	78	64.9	59.9	61
Mean Condensing Temperature	°C	40	40	40.1	40
Condensing Pressure	bar.g	14.323	14.569	15.059	12.986
Condenser Sub Cooling	K	5	5	5	5
Liquid Line Subcooling	K	5	5	5	5
Liquid Line Temperature	°C	30	27.9	28.9	28.5
Compressor Displacement	m3/h	8.8	8.8	8.8	8.8
Volumetric Efficiency	%	100.00%	100.00%	100.00%	100.00%
Isentropic Efficiency	%	70.00%	70.00%	70.00%	70.00%
Mass Flow	kg/s	0.057	0.064	0.076	0.062
Cooling Capacity	kW	10	9.6	9.6	8.6
Compressor Power	kW	2.1	2	2.1	1.8
C.O.P.		4.832	4.755	4.654	4.77