EXPERT KNOWLEDGE September 2018

Low-GWP refrigerants – the magic word!

What does Low GWP actually mean? What expectations does it create? The drivers of low-GWP refrigerants are the quotas set by the F-Gas Regulation. The search for THE refrigerant is far from new. Can fundamentally new solutions be expected? Plant manufacturers, refrigerant business operators, manufacturers, R&D or marketing and sales employees, in particular, need to be able to assess this subject correctly.

At the last Chillventa, two years ago, it was standing room only in the industry forums that introduced and discussed new refrigerants, solutions for individual sectors, low-GWP refrigerants and the risks associated with flammable refrigerants. The demand for information about consequences and opportunities has not changed. Once again this year, Chillventa will offer more than 30 lectures on refrigerants in its three industry forums. See Backup I: Lectures in the Chillventa forums. Book your ticket for the exhibition and industry forums now.

Quotas under the F-Gas Regulation

The quota for 2018 is 63 % of the baseline value for 2015, which was calculated from the average for 2009-2012 and set as the 100 percent figure. At the German Society of Refrigeration and Air Conditioning (DKV) event held in Darmstadt in February 2018, it was demonstrated in detail that the actual value for 2018 is already below the 50 % mark. The DKV lectures may be found here; see Status Report no. 33.

Long-standing search for THE refrigerant

The usability of a fluid as a refrigerant depends on its physical, thermodynamic, chemical, physiological, economic and environmental properties. All the requirements for an ideal refrigerant are unlikely to be met by a single fluid, which means compromises always have to be made to select the right fluid for each application.

In principle, any substance can be used as a refrigerant if it liquefies at industrially achievable pressures and can be evaporated at the desired low temperatures. The only prerequisite is that the critical refrigerant temperature and pressure are far enough above the normal operating temperatures, and that the solidification temperature is far enough below that range. Exceptions are hypercritical applications such as the use of R-744.

In 1956, Rudolph Plank wrote as follows in the Manual of Refrigeration:
“An ideal refrigerant that meets all of the stated requirements has not yet been found, and will probably not be found in the future. We will therefore have to make do with satisfying the key demands on a case-by-case basis, and live without the requirements we cannot satisfy."

The current state of scientific knowledge is that, of all the elements in the periodic table, only eight are essentially suitable for use as refrigerants. The potential combinations have been intensively and repeatedly investigated in the past 50 years. It is therefore known that solutions can currently be found only in mixtures. Any expectation of discovering new refrigerants is probably only wishful thinking or dreaming.
The mixture-based solutions can be seen in the large number of combinations in the 400 series. A current overview, including numbers and compositions, can be found here (click on “Zeotropes”).
Have a chat about this with the experts at Chillventa. Get your ticket here.

What does Low GWP actually mean?
The admissible sales quotas are based on the GWP values of the refrigerants. The magic word is therefore Low GWP. So what does it actually mean?
Low GWP is not defined anywhere. Looking at the GWP values (see Backup II) for various “substances” (not only refrigerants), the range is between 0 and well over 20,000. In addition to the GWP value, lifetime in the atmosphere must also be considered.

When this subject was first raised, the expression Low GWP was used to show that a solution had been found with a much lower value than the refrigerants previously used:

R-404A	(3,922)	→	R-452A	(1,950)
R-404A	(3,922)	→	R-407F	(1,825)
R-410A	(2,088)	→	R-32	(675)

UNEP report TEAP 2010 Progress Report, Volume 1, 2010, contains a proposal for a graduated system (ultra high, very high, high, moderate, low and ultra low), which is explained and illustrated here. UNEP then made increasing use of the expressions low – medium – high in 2013.
The solution that is desired or ultimately found must be further assessed to determine whether the replacement product is explosive or toxic. If the goal is a direct solution rated A1 (non-toxic/non-flammable), it will quickly become evident that the Low GWP solutions to replace R-404A or R-134a are in the 1,000-1,100 or 500-600 range.

That is why more use is being made of further solutions rated A2, A2L and A3, moving a step away from the “safe” A1 toward “flammable”. The trend toward A2L is clear on the global market, and also appears to be a practical way of minimising the risk.

More expertise at Chillventa
Chillventa offers a wealth of information on all aspects of refrigerants, with more than 30 presentations in its three industry forums. All major refrigerant manufacturers and industry wholesalers are represented. Contacts in the form of national and European associations are available on-site at Chillventa. Experts are on hand at the forums to provide visitors with knowledge on all aspects of refrigerants in compact form.

Book your Chillventa ticket now to attend the exhibition and take part in the forums.

The Chillventa CONGRESS, held the day before the actual Chillventa exhibition, will offer an up-to-date overview of the market, opportunities and developments. The subject of the F-Gas Regulation will be discussed in detail at the ASERCOM-EPEE Symposium.

Reserve your ticket for the Chillventa CONGRESS now.

Backup I, “Presentations on refrigerants” in the 2018 Chillventa Forums
Backup II, Table: Substances-GWP-Application

For more information please visit: **www.chillventa.de**

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