Double digit drop in refrigerant leak rates

With the HFC phase down putting pressure on refrigerant prices and HVACR professionals struggling to contain energy costs, its not surprising to learn that there has been a significant drop in refrigerant leak rates.

TOP: The most common causes of leaks have been eliminated over the last decade.

ABOVE: Half a tonne of R22 ready for destruction.

REFRIGERANTS AUSTRALIA HAS released an important study on refrigerant leak rates across Australia's refrigeration and air conditioning industry from 2006 to 2022.

It represents the first accurate calculation of leak rates across 15 product categories and shows that most leaks are preventable.

The report findings underscore the importance of actively managing refrigerant leaks throughout the lifecycle of RAC equipment.

This includes improving technician training, eliminating preventable refrigerant leaks, recovering refrigerants, and destroying or reconditioning them for re-use at the end-of-equipment life.

Refrigerant leaks are a critical issue, as they contribute to both greenhouse gas emissions and inefficiencies in system performance which increase power use.

While some common causes of leaks have been effectively eliminated over the last decade, the majority of the remaining causes of direct emissions are preventable.

They are largely due to poor-quality equipment and materials, the use of components that are susceptible to leaking, substandard installation practices, inadequate maintenance, and failure to correctly remove refrigerants when equipment reaches the end of its service life.

The key sources of emissions from the leakiest category of equipment - commercial refrigeration equipment – are caused by failures of containment in condensers, evaporators, joints, valves, connection points and pipework.

In 2022, refrigerant leaks in Australia were responsible for 6.9 Mt of CO_2-e emissions.

It is considered a truism that a significant proportion of refrigerant losses arises from a small number of systems. These losses are primarily due to failures caused by poor design, installation, or maintenance.

"Leak rates in the early 2000s were above 20 per cent per annum."

With a medium to large refrigeration system, the trigger for a leak is generally a temperature alarm. In many instances 30 per cent of the charge can be lost by the time the alarm is tripped.

The evolution of wall-hung and ducted split air conditioning equipment demonstrates this design evolution.

For instance, the older generation equipment from the 1990s and the 2000s, contained HCFC-22 and had average annual leak rates in the order of eight to 12 per cent.

In contrast, the current generation of models in the fleet have leak rates of around four per cent per annum.

Another factor that contributed to the reduced leak rates was the refrigerant transition from HCFC-22 to HFC-410A. This new refrigerant required an improved flaring angle. This meant that technicians had to upgrade their old flaring tools.

The shift in angle improved the strength of the flared connection and helped prevent leaks under the higher pressures that HFC-410A systems require.

The Australian market has demonstrated that as the cost of refrigerant increases, and as field practices improve, leak rates decline.

The Australian supermarket industry is another example of the capacity of industry to reduce direct emissions.

Leak rates in the early 2000s were above 20 per cent per annum. Additionally, the leak rates published by the Australian Greenhouse Office in 2008 for commercial refrigeration applications were 23 per cent.

Current market intelligence indicates that leak rates of HFC 404A and HFC-134a are likely to be less than half this within the main supermarket chains

The study found that sources of leaks are generally components that fail and cause refrigerant loss, system design, performance characteristics, and workplace practices that increase the likelihood of leaks. Degradation and eventual failure of equipment components accelerate the process.

The 2024 review indicates that over 25 per cent of the leak sources reported in 2010 have been effectively eliminated through the implementation of new components and processes. Additionally, 45 per cent of the leak sources identified in 2010 have either become less prevalent due to improved practices and upgraded components or are in the process of decreasing as the industry adopts higher-quality components, manufacturing processes, and materials.

However, 30 per cent of the causes reported in 2010 continue to be significant or common sources of leaks, such as flare joints and return bends on evaporators and condensers.