

Making the Plan: A World Without R-22 Isn't Worlds Away

By

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In the United States, compliance to the Montreal Protocol on Substances That Deplete the Ozone Layer, the 1987 international treaty designed to reduce greenhouse gas emissions, is regulated by the Environmental Protection Agency under Title VI of the Clean Air Act. Complying with the timetable set forth in the Act, U.S. production of Class I Chlorofluorocarbon (CFC) refrigerants was completely halted in 1996. CFCs are considered to be the most damaging to the ozone layer and are identified as Ozone Depleting Substances (ODS), substances which may impact the climate.

For companies using CFC refrigerants, one available alternative was Class II Hydrochlorofluorocarbon (HCFC) refrigerants such as R-22. Because these refrigerants allowed companies, in most cases, to retrofit existing CFC equipment, this option was initially seen as less expensive than complete replacement.

Yet it was not a perfect solution. Just like CFCs, R-22 and HCFCs are also ODS and may impact the climate. Because of this, no new HCFC equipment is to be produced, accompanied by a 65% reduction in production of these refrigerants by January 1, 2010. While the complete phase out of all HCFC refrigerants is currently scheduled to occur in 2030 – a date that may seem to be far in the future – it is still something that needs to be monitored closely. One reason why: Discussion is taking place at the federal level that may speed up the complete phase out by ten years to 2020.

For plant owners and managers, these dates require planning for factors such as:

- Alternatives available and how these will work within the operation.
- Age and service history of existing equipment and the difficulty of retrofitting/servicing/maintaining that equipment over time.

Available Options

Refrigerant options to replace HCFCs depend on whether the option is being used as a replacement in an existing system or for a new installation and the available non-ODS alternatives:

- Hydrofluorocarbons (HFCs) are an approved replacement for both CFCs and HCFCs for a retrofit and are not scheduled to be phased out at this time. However, while considered to be non-ODS, these refrigerants may impact the climate and therefore may also be placed on the phase out list sometime in the future. Should this happen, the same issues affecting HCFC refrigerants will occur for HFCs, such as decreased capacity and efficiency, along with an inability to obtain spare parts for aging equipment. For retrofits, some HFC options include: R-407c, R-417, R-422a, R-422d and R-507. Some of the HFC options for new equipment include: R-134a, R404a, and R410a.
- Non-ODS Alternatives. Ammonia R-717 is the main non-ODS, non climate-impacting refrigerant in this category, and as such, there is little danger that it will be phased out anytime soon. At the same time, ammonia is toxic and flammable and facilities that use it may need to adhere to OSHA's Process Safety Management of Highly Hazardous Chemicals standard (29 CFR 1910.119) whether required to comply or not.

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When considering conversion options, it is important to keep in mind that a goal should be to limit the number of different refrigerants used on site while maintaining the same equipment performance and capacity levels. Each replacement refrigerant poses different operating issues such as capacity reduction, higher operating pressures and temperature glide. If consideration is given to convert existing equipment, it is important to consider the current operating conditions of the equipment. If the existing systems were well maintained, they can be operated to the end of their expected service lives using the appropriate replacement refrigerants.

To Convert or Replace: That is the Question

In reviewing existing equipment and considering the move away from Class II refrigerants, two big issues to consider are the probability of future leaks and age of the equipment. Because non-ODS refrigerants operate at higher pressures, a system that has been susceptible to leaks in the past and/or has reached the end of its useful lifecycle will have a higher leak rate than new equipment. In general, it is better to replace these units with new equipment than convert them to a non-ODS refrigerant.

As a rule, most HCFC equipment has an average life expectancy of 10-20 years; however, some can operate well past that date:

- 20 years or older: Equipment in this category is generally a good candidate for replacement. This equipment will have reached the end of its useful life and newer equipment will typically have higher operating efficiencies.
- 10-20 years: Equipment in this category is difficult to bracket. Equipment condition, maintenance history, equipment capacity vs. load, and equipment operating efficiencies all must be taken into account. Companies may want to contact a qualified engineer to assess the usefulness of equipment at this age.
- Up to 10 years: Equipment in this category is most likely a good candidate for conversion. This age group usually reflects improved design efficiencies. They are also in the middle of their industry-standard lifecycles. However, equipment condition and leak history must be taken into account for each individual unit.

Planning the Future

As with the conversion from CFC to HCFC, costs and speed of the return on investment will certainly be a factor in whether to move completely to a non-ODS refrigerant or use an HFC refrigerant to replace existing HCFC supplies. It is a decision that every company will face and should be based on the individual circumstances of the operation. The most important thing, however, is to do *something* today. Consider all the options available and begin planning for the future by developing a long-term, comprehensive plan for addressing refrigeration conversion issues.

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