

ASHRAE Technical FAQ

ID 33

Question What is the phase-out schedule for HCFC refrigerants?

Long
Answer

HCFCs already in use, stockpiled for future use, or recovered – and reclaimed when required – from retired or converted equipment may be used indefinitely. New HCFC production is limited, based on 1989 CFC and HCFC levels, and will be decreased in successive steps starting in 2004. It will end for new equipment by 2020 and for service by 2030. The controlled amounts are adjusted to exclude allowed exports, exclude quantities for exempted uses, and add imports. There are exceptions to this answer, for example in countries that have implemented more stringent measures or schedules than stipulated in the Montreal Protocol, most notably several in Europe. Also, the schedule for developing countries – or more precisely “Article 5 Paragraph 1” countries – is delayed, starting with a production and import freeze in 2016 and ending with phaseout by 2040. The primary HCFC refrigerants are R-22, used in a broad range of applications and currently the most widely used refrigerant, and R-123, the most commonly used refrigerant in centrifugal chillers. Others include R-124 and R-142b, both primarily as blend components. National regulations in Canada and the United States mandate phaseout of R-22 and R-142b for manufacture of new equipment by 2010 and of all HCFCs for such use by 2020. Those regulations allow limited production for service and stockpiling for service until 2030, consistent with the Montreal Protocol. Some European countries already ban HCFC use in new equipment and even for service of existing equipment.

The Montreal Protocol actually restricts “consumption” rather than use of ozone-depleting substances, but it defines consumption as production plus imports less exports and tightly controlled, exempted uses. By addressing production and international trade rather than use, the Protocol allows each country to determine whether and how to allocate both the limited amounts by application and the production quotas by manufacturer. Those issues exceed the scope of this response, but further information is available from other sources, some of which are identified below. The Protocol placed a limit, often referred to as cap, on HCFC production (actually “consumption” as defined) beginning in 1996 in developed countries. The cap equals 2.8% of CFC plus 100% of HCFC “consumption” in 1989, both weighted by the ozone-depletion potentials (ODPs) of the individual substances. Further reduction steps will follow. Those steps will limit “consumption” to 65% of the cap by 2004, 35% by 2010, 10% by 2015, 0.5% by 2020, and finally 0% (phaseout) by 2030. The 0.5% allowance from 2020 to 2030 explicitly provides for limited production to service existing equipment; it often is referred to as the “HCFC service tail.” The

Montreal Protocol does not restrict subsequent use of HCFCs to service existing equipment from quantities stockpiled or in use before production phaseout, though some national regulations do so. It also does not restrict HCFC manufacture as intermediates (feedstocks) to produce other chemicals. The remainder of this response focuses on use of HCFCs as refrigerants rather than for foam blowing, solvent, aerosol propellant, fire suppressant, or other purposes. The regulations on refrigerant phaseouts in Canada and the USA are similar. They ban production and imports of R-22 and R-142b for new equipment starting in 2010, but allow their continued use to service existing equipment and also their export. These regulations call for production phaseout by 2020, again except for export and very limited, exempted uses such as scientific laboratory studies. Production and import of R-123 and R-124 will end by 2020 for new equipment, but will be allowed to service existing equipment and for export until 2030. Production of HCFCs for export to developing countries will end by 2040. There are no restrictions against future use of HCFCs from legally stockpiled or recovered (including reclaimed) sources for future service, even after 2040. Projected inventories augmented by recovered stocks should be sufficient to meet future service needs with responsible reductions of leaks and with optional use of service fluids in some applications. “Service fluids” refer to substitute refrigerants to meet service needs; they often are blends and typically have lower ODPs – practically zero ODP in some. Regulations are more restrictive in the European Union (EU). Those requirements base the cap on 2.0% of CFC plus 100% of HCFC “consumption” in 1989, both weighted by the ODPs of individual substances. EU regulations reduced use by 15% starting in 2002 and will reduce use by 55% in 2003, 70% in 2004, 75% in 2008, and 100% (phaseout) in 2010. The EU limits also restrict HCFC uses in specific air-conditioning and refrigeration equipment. Several individual European countries further accelerate these schedules and already prohibit use of HCFCs to service some equipment. The following web sites provide more specific information: Montreal Protocol treaty requirements: http://ozone.unep.org/new_site/en/montreal_protocol.php

[2017 ASHRAE Handbook - Fundamentals, Chapter F29](#)

[2014 ASHRAE Handbook - Refrigeration, Chapter R06](#)

ASHRAE Pubs

Refrigerants for the 21st Century (proceedings of the ASHRAE /NIST Conference, Gaithersburg, MD), October 1997

[ASHRAE/NIST Refrigerants Conference Proceedings – Moving Towards Sustainability](#)

Topic References HCFC, phaseout, Montreal Protocol, ODP’s, refrigerant

	Cognizant ASHRAE Committees	Refer to Organization
1	TC 2.5	
2	TC 3.1	
3		
4		
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