



The R-12 and R-22 Phase-Out in India: Preparing for Critical Changes in the Refrigerant Landscape

The HVAC&R industry is one of the largest consumers of CFCs and HCFCs and is highly influential in reducing demand for R-12 and R-22.

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Twenty years ago, the Montreal Protocol began setting aggressive, but achievable, timetables to reduce and eventually eliminate ozone depleting substances (ODSs), including chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). Today, rigorous monitoring and analysis of the ozone layer has shown early signs of ozone recovery¹ however, this progress is fragile, and any failure to comply with the Protocol's requirements moving forward will threaten the advancements made to date. Consequently, governments and regulatory bodies around the world continue to enact additional measures to restrict the release of ODSs and enhance continued

recovery of the ozone layer. As this trend continues, it is increasingly important for the global HVAC&R industry to take immediate steps to decrease its use of ODSs.

As one of the largest producers and consumers of CFCs and HCFCs, the HVAC&R industry is highly influential in reducing demand for many refrigerants, such as R-12 (CFC-12) and R-22 (HCFC-22). One way that HVAC&R contractors and equipment owners can comply with the CFC and HCFC reduction targets outlined in the Montreal Protocol is to transition to hydrofluorocarbon (HFC) refrigerants. These alternative options have zero ozone depletion potential (ODP) and are cost effective since they can be used to retrofit

existing equipment. In many cases, they deliver performance that is equal to, or better than, R-12 and R-22.

This article will provide an overview of the CFC and HCFC phase-out schedule and its impact on the HVAC&R industry in India. It will also discuss the performance of various alternative HFC refrigerants that can help facilitate a faster transition from ODSs.

The Situation Today : CFC/HCFC Phase-out in India

India became party to the Montreal Protocol in 1993 and has since made significant progress in decreasing its dependence on CFCs. The country

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¹ United Nations Environment Programme/World Meteorological Organization. "Executive Summary," *Scientific Assessment of Ozone Depletion*, 2006 August 18, 2006, xxxv. http://ozone.unep.org/Assessment_Panels/SAP/Scientific_Assessment_2006/02-Executive_Summary.pdf

banned the manufacture of new products using R-12 on December 31, 2002. As of January 1, 2007, the country achieved an 85 percent reduction in CFC production and consumption – a full year ahead of the Protocol schedule for CFC phase-out in Article 5 (developing) countries². India, in accordance with the terms of the Protocol, must focus on further reducing its CFC consumption to zero by 2010. In anticipation of this step-down in just 19 months, CFC manufacturers have already stopped supplying CFCs for consumption in India for uses other than pharmaceutical aerosol applications. This action will likely result in shortages for servicing CFC equipment in the very near future.

Additionally, India must also begin to take steps to decrease its dependence on HCFCs. Recent studies show that the level of HCFC-22 in the atmosphere continues to rise³. In an effort to reduce the risk of future ozone depletion, parties to the Montreal Protocol, in September 2007, agreed to an accelerated HCFC phase-out schedule. According to this revised timeline, developing countries must begin to reduce their use of HCFCs from the baseline consumption – set at the average of 2009 and 2010 consumption – to be set in 2013, which is less than five years from now. This new baseline is expected to be below HCFC market demand assuming continued market growth in 2011 and 2012. The Montreal Protocol accelerated schedule is:

- Freeze at baseline in 2013
- 10 percent reduction by 2015
- 35 percent reduction by 2020
- 67.5 percent reduction by 2025
- 97.5 percent reduction by 2030 – 2.5 percent is

allowed during the period 2030-2040 for servicing.

Impact of the Montreal Protocol on the HVAC&R Industry in India

The recently accelerated terms of the Protocol do not require India to significantly reduce its HCFC production or consumption in the short term; however, a more aggressive HCFC phase-out in other countries could have repercussions for the Indian HVAC&R market. Thus, there exists a strong, two-pronged rationale for India to begin transitioning to HFCs.

First, developed countries continue to rapidly discontinue their use of HCFCs. Japan and the EU no longer use HCFCs in new equipment. These actions are driven by the phase-out schedule that requires developed countries party to the Protocol to achieve a 75 percent reduction target for HCFCs by 2010 – less than 100 weeks from now. The transition to HFC refrigerants, both for new

and existing equipment, will accelerate as this deadline nears. However India has not declared any date for phasing out the manufacturing of new equipment using HCFC but if India is to remain an active participant in the HVAC&R export market moving forward, it must make the transition to HFCs so it can continue to supply refrigeration and air conditioning equipment to developed countries.

Second, the HVAC&R industry is now designing new equipment specifically for use with HFCs. In addition to helping countries decrease their dependence on HCFCs and meet the Protocol phase-out requirements, this new equipment is also proving to be highly energy efficient. The energy savings that can result from using equipment designed for HFCs is incentive for India and other developing countries to discontinue its use of ODSs.

The HVAC&R industry in India can decrease its dependence on CFCs and HCFCs in various ways. This includes:

- **Understanding CFC and HCFC phase-out requirements and deadlines** and staying aware of updates in developing countries, as well as in developed countries. This is important to ensure continued export of HVAC&R equipment that meets regulations.

- **Taking steps to minimize CFC and HCFC emissions** by repairing leaks immediately, regardless of the type of refrigerant or substitute being used, and ensuring proper equipment design and installation for all new equipment. In new and existing equipment, it is also important to track system performance relative to regulatory requirements.

- **Increasing awareness of new equipment that is designed specifically for HFC refrigerants.** In addition to addressing environmental considerations, new equipment designed for HFCs is a viable option when existing systems must be replaced due to age or leaks.

- **Retrofitting existing equipment to non-ODP alternative refrigerants.** HFC retrofit refrigerants deliver the same, or better, performance as CFCs and HCFCs, in many cases, and decrease dependence on these compounds. They enable continued use of existing refrigeration equipment, eliminating costly equipment replacement and minimizing business disruption and downtime. Retrofit refrigerants also facilitate compliance with environmental regulations. Since they have zero ODP, they are not subject to the Montreal Protocol phase-out schedule; however, these HFC refrigerants should be managed responsibly.

² Dr. Manmohan Singh, "The Montreal Protocol: India's Success Story," *International Day for Preservation of the Ozone Layer*, 16 September 2007. <http://www.ozonecell.com/uploads/files/1201586613819-SS-2007-%20Final%20Web%20Uploaded.doc>

³ United Nations Environment Programme/World Meteorological Organization. "Executive Summary," *Scientific Assessment of Ozone Depletion*, 2006 August 18, 2006, xxv

continued from page 104

HFC Alternatives

Today, HFC technology is available to retrofit or replace all HCFC equipment. There are several retrofit refrigerants available to help the industry phase out its use of R-12 and R-22 in existing equipment and meet the newly accelerated Montreal Protocol phase-out targets. Although R-11 is also included in the CFC phase-out, no HFC retrofit refrigerant currently exists to replace it.

HFC Retrofit Refrigerant for R-12

R-437A (ISCEON® MO49Plus™) is an efficient and cost-effective HFC retrofit refrigerant for replacing R-12 in automotive air conditioning and stationary refrigeration systems, and for replacing HCFC-containing refrigerant blends (e.g., MP39, MP66, and R-409A) in stationary refrigeration systems. It also replaces R-413A (ISCEON® MO49). R-437A is compatible with traditional and new lubricants; in most cases no change of lubricant during retrofit is required. This refrigerant option also has zero ODP and is not subject to phase-out under the Montreal Protocol. R-437A provides similar to slightly lower efficiency versus R-12 and lower discharge temperature versus R-12.

R-437A is not recommended for use in centrifugal compressor systems or for chillers with flooded evaporators or low pressure receivers.

HFC Retrofit Refrigerants for R-22

R-422D (ISCEON® MO29) replaces R-22 in medium temperature, direct expansion refrigeration applications (can also be used for low temperature), including commercial supermarket systems, and in stationary DX air conditioning applications, including DX water chillers. It is the closest match to R-22 capacity and efficiency in most systems, but has significantly lower discharge temperatures, which are likely to prolong the life of the compressor. R-422D also provides the best performance of any mineral oil-compatible blend where minimal equipment changes are desired. R-422D is rapidly becoming the HFC retrofit refrigerant of choice around the world for many types of R-22 equipment.

There are also alternative HFC options available for new equipment. The leading refrigerants for these applications include:

- **R-404A** continues to lead the way as the global industry standard HFC refrigerant for new commercial refrigeration applications. R-404A delivers exceptional capacity and efficiency as an R-502 and R-22 replacement in refrigeration applications and is approved for use by the leading compressor and equipment manufacturers worldwide.
- **R-410A** has been in the marketplace for more than 10 years and is the leading HFC refrigerant for replacing R-22 in residential and light commercial air-

conditioning and heat pump systems. It has at least five percent greater efficiency in most systems compared to R-22 and 40 percent greater refrigeration capacity per pound of refrigerant. Additionally, R-410A has a reduced environmental footprint versus an R-22 unit that is comparable in size. With vapor pressure approximately 60 percent higher than R-22, R-410A should only be used in new systems designed for this refrigerant and should not be substituted into existing R-22 systems.

- **R-407C** is an HFC refrigerant replacement for R-22 in systems such as new or existing residential and commercial air conditioners and heat pumps. R-407C offers similar capacity and energy efficiency to R-22 and can be used to retrofit existing R-22 air conditioning systems; however, a change to polyol ester lubricant is required. R-407C can also be used to replace R-502 for some existing medium temperature applications with evaporator temperatures above +20°F (-7°C).

Contractors and equipment owners who use R-410A and R-407C should be aware that these refrigerants are being sold by unauthorized sources throughout Asia. DuPont, which owns patents for both, has recently taken legal action in China and Malaysia to halt the illegal trade of these refrigerants and to ensure its customers continue to receive the high quality refrigerants they expect.

S.No.	ODS	Retrofit Replacement	New Equipment Replacement
1	R-12	R-437A (ISCEON® MO49Plus)	R-134a
2	R-22	R-422D (ISCEON® MO29)	R-407C, R-410A
3	R-502	R-422A (ISCEON® MO79)	R-404A
4	R-13	ISCEON® MO89	Suva® 95

A guide to HFC alternatives.

Conclusion

In accordance with the Montreal Protocol, India will no longer be able to use CFC-based refrigerants in air conditioning and refrigeration equipment as of January 1, 2010 and is accelerating the phase-out of CFC supply well in advance of this deadline. HCFCs, such as R-22, which were once used as a substitute for CFCs, are also facing an accelerated phase-out worldwide. As a result, many markets are significantly curtailing their use of all HCFCs and transitioning to completely non-ODS HFC refrigerants.

As more countries move in this direction, it will be important for India to have a plan in place that will allow the Indian HVAC&R industry to adapt and respond to these changing global regulations. Contractors and equipment owners must understand what options are available to help them reduce their R-12 and R-22 consumption. Using HFC refrigerants with zero ODP for new and existing equipment is one way to safely and cost-effectively facilitate a smooth transition from CFCs and HCFCs with minimal disruption to businesses. ❖