

ALTERNATIVES TO HCFCs FOR NEW EQUIPMENT

This list is a quick reference to raise awareness of National Ozone Units about available alternatives to replace or avoid HCFCs, which should be considered during the preparation of their countries' HCFC Phase out Management Plans (HPMPs).

The list indicates replacements for HCFCs for specific applications, based on references in the assessment reports of the UNEP Technology and Economic Assessment Panel (TEAP) and its Technical Options Committees (TOCs). Only those alternatives which those report identify as being commercially-available or being presently used by companies are included on this list. The list does not include alternatives that the TEAP/TOC reports indicate as being “future technologies” or in the research and development stage.

For many of the applications listed below, the HCFC and the non-HCFC options have co-existed for some time as replacements for CFCs. However, in light of the acceleration of the HCFC phase out resulting from Meeting of the Parties Decision XIX/6, this list places renewed attention on the non-HCFC options that are currently available.

Note:

- This table only presents non-HCFC options for new equipment. It does not address or conversion of existing equipment (retrofits) or drop-in replacements.
- In some cases, the alternatives indicated are for very specific applications.
- Some of the alternatives listed may not be available in all markets.
- The alternatives are listed in alphabetical order.

Sectors where HCFCs may be used	Specific application	Non-HCFC alternatives
HCFC-22		
Unitary air conditioning equipment	Small self-contained air conditioners	<ul style="list-style-type: none"> • HFCs (R-407C, R-410A) • Hydrocarbons (R-290)
Small water chillers of about 100 kW refrigeration capacity up to the capacity of centrifugal chillers	Screw chillers	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (R-134a, R-410A)
	Scroll chillers	<ul style="list-style-type: none"> • HFCs (R-134a, R-410A, R-407C)
	Reciprocating chillers	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (R-134a, R-407C) • Hydrocarbons (R-290) • Propylene (R-1270)
	Centrifugal chillers	<ul style="list-style-type: none"> • HFCs (R-134a)
Commercial refrigeration equipment	Large supermarket systems	<ul style="list-style-type: none"> • Ammonia (R-717) • Carbon dioxide (R-744) • HFCs (R-404A, R-407C, R-134a)

Sectors where HCFCs may be used	Specific application	Non-HCFC alternatives
		<ul style="list-style-type: none"> • Hydrocarbons (R-290, HC-1270)
	Cold storage	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (R-134a)
	Ice cream freezers	<ul style="list-style-type: none"> • Carbon dioxide (R-744) • HFCs (R-404A, R-134a) • Hydrocarbons (R-290)
	Water fountains	<ul style="list-style-type: none"> • Hydrocarbons (R-600a)
	Ice making machines	<ul style="list-style-type: none"> • HFCs (R-134a)
	Vending machines	<ul style="list-style-type: none"> • Carbon dioxide (R-744) • HFCs (R-134a) • Hydrocarbons (R-290, R-600a)
	Glass-door bottle coolers	<ul style="list-style-type: none"> • Carbon dioxide (R-744) • HFCs (R-134a) • Hydrocarbons (R-290, R-600a)
	Plug-in display cabinets	<ul style="list-style-type: none"> • HFCs (R-404A)
	Condensing unit systems (medium-sized commercial refrigeration)	<ul style="list-style-type: none"> • HFCs (HFC-134a, R-404A, R-507A) • Hydrocarbons
Heat pumps	Water-heating heat pumps	<ul style="list-style-type: none"> • Ammonia (R-717) • Carbon dioxide (R-744) • HFCs (R-134a, R-410A, R-407C, R-404A) • Hydrocarbons
Industrial refrigeration	Spiral, tunnel and blast freezers	<ul style="list-style-type: none"> • Ammonia (R-717) • Calcium chloride (“brine”) • Carbon dioxide (R-744) • Ethylene glycol • HFCs (R-404A)
	Industrial heat pumps and heat recovery	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (R-134a, R-404A, R-407C) • Hydrocarbons • Water (R-718) and lithium bromide (absorption)
	Cooling of blade server computers in data centres	<ul style="list-style-type: none"> • Carbon dioxide (R-744)
	Industrial chillers	<ul style="list-style-type: none"> • Water (R-718)
	Refrigerants for deep mines	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (HFC-134a) • Water (R-718)
Refrigerated transport and mobile air conditioning (excluding passenger vehicles)	Reefer ships	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (R-134a, R-404A, R-407C, R-410A, HFC-23)
	Refrigeration and air conditioning on merchant marine, naval and fishing vessels	<ul style="list-style-type: none"> • Ammonia (R-717) • Ammonia/carbon dioxide (R-717/R-744) • HFCs (R-134a, R-507, R-404A, R-407C, R-410A)

Sectors where HCFCs may be used	Specific application	Non-HCFC alternatives
	Intermodal refrigerated containers	<ul style="list-style-type: none"> • HFCs (R-134a, R-404A)
	Refrigerated railcars	<ul style="list-style-type: none"> • Carbon dioxide (R-744) • HFCs
	Road transport (trailers, diesel trucks, small trucks)	<ul style="list-style-type: none"> • Carbon dioxide (R-744) • HFCs (R-404A, R-134a, R-410A) • Hydrocarbons (R-290, R-600a)
	Air conditioning in trains	<ul style="list-style-type: none"> • Air cycle systems • HFCs (R-134a, R-407C)
	Air conditioning in buses	<ul style="list-style-type: none"> • HFCs (R-134a)
Foam	Extruded polystyrene foam	<ul style="list-style-type: none"> • Carbon dioxide (LCD) or with hydrocarbon blends • HFCs (HFC-134a, HFC-152a) • Hydrocarbons • Water
	Rigid polyurethane foam (various applications)	<ul style="list-style-type: none"> • Carbon dioxide (water) • HFCs (HFC-134a, HFC-245fa, HFC-365mfc) • Hydrocarbons
	Polyethylene foam	<ul style="list-style-type: none"> • Hydrocarbons
HCFC-141b		
Foam	Rigid polyurethane foam (various applications)	<ul style="list-style-type: none"> • Carbon dioxide • HFCs (HFC-134a, HFC-152a, HFC-245fa, HFC-365mfc) • Hydrocarbons (Pentane) • Supercritical carbon dioxide
	Integral skin foam	<ul style="list-style-type: none"> • Carbon dioxide • HFCs (HFC-134a) • Non-halogenated alternatives
	Phenolic foam	<ul style="list-style-type: none"> • 2-chloropropane • HFCs (HFC-365mfc, HFC-227ea) • Hydrocarbons
Solvent applications		<ul style="list-style-type: none"> • HFCs (HFC-4310mee, HFC-245fa) • HFEs • Not-in-kind substitutes (no-clean, aqueous, hydrocarbon, oxygenated solvents) • PFCs • PFEs
Aerosols	Non-medical aerosol products	<ul style="list-style-type: none"> • HFCs (HFC-134a) • HFEs • Hydrocarbons • Not-in-kind substitutes (mechanical pumps, sticks, roll-

Sectors where HCFCs may be used	Specific application	Non-HCFC alternatives
		ons, brushes, etc.) • Water
HCFC-142b		
Foam	Extruded polystyrene board foam	<ul style="list-style-type: none"> • Carbon dioxide (LCD) or with hydrocarbon blends • HFCs (HFC-134a, HFC-152a) • Hydrocarbons • Water
	Polyethylene foam	<ul style="list-style-type: none"> • Hydrocarbons
HCFC-225 ca/cb		
Speciality solvents	Precision cleaning and as a carrier solvent	<ul style="list-style-type: none"> • HFEs
	Cleaning implantable or surgical medical devices	No information
HCFC-123		
Low-pressure refrigerant in large air conditioning chillers	Centrifugal chillers	<ul style="list-style-type: none"> • HFCs (HFC-134a)
	Refrigerants for deep mines	<ul style="list-style-type: none"> • Ammonia (R-717) • HFCs (HFC-134a) • Water (R-718)
Fire extinguishant	Portable fire extinguishers	<ul style="list-style-type: none"> • AFFF • Carbon dioxide • Dry chemical (Potassium bicarbonate, Sodium bicarbonate) • HFCs (HFC-236fa, HFC-227ea) • Multipurpose dry chemical • Water fog • Water stream
Specialty solvents	Electronics cleaning	<ul style="list-style-type: none"> • Not-in-kind alternatives (no-clean processes; aqueous and semi-aqueous cleaning) • Oxygenated solvents (e.g. alcohols, glycols, ethyl lactate)
HCFC-124		
Heat pumps		No information
Special air conditioning equipment		No information
Sterilant mixtures		No information
Fire extinguishant	Total flooding applications	<ul style="list-style-type: none"> • Aerosol powders (Powdered Aerosol A, Powdered Aerosol B) • Carbon dioxide • Gaseous agents containing particulate solids (HFC227-BC) • Gelled mixture of HFC plus dry chemical additive) • HFCs (HFC-125, HFC-23, HFC-236fa, HFC-227ea, HFC Blend

Sectors where HCFCs may be used	Specific application	Non-HCFC alternatives
		A) <ul style="list-style-type: none"> • Inert gases (IG-01, IG-100, IG-541, IG-55) • Iodofluorocarbon (FIC-13I1, FIC-217I1) • Perfluoroketone (FK-5-1-12) •
	Local application fire protection	<ul style="list-style-type: none"> • Carbon dioxide • Dry chemical • Foam • HFCs (HFC-236fa, HFC-227ea) • Surfactant blend A • Water

Sources:

UNEP, *May 2008 Technology and Economic Assessment Panel Progress Report, Volume 1* (2008, Nairobi, Ozone Secretariat)

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