Technical Guideline (7)

Policy on the Control of Ozone Depleting Substances

December 2014

1.0 Introduction:

The chimney or stack height plays a role to discharge and disperse the air pollutants at higher altitude and over wider area to reduce their concentrations and impact on the ambient air and to maintain the air quality in compliance with regulatory limits.

The ozone layer in the stratosphere between 10 and 50 km above the earth protects us from the harmful effects of ultra-violet (UV) radiation from the sun. But, the thinning of ozone layer which was discovered in 1974 due to halogenated hydrocarbons such as CFCs (Chlorofluorocarbons) increases the amount of UV reaching the earth and can suppress the human body's immune system making people vulnerable to diseases, increase skin cancers, cause eye disorders such as cataracts and also damages marine life and reduces crop yields.

The Governing Council of the United Nations Environment Programme (UNEP) first discussed the issue of ozone depletion in 1976. A meeting of experts on the ozone layer was convened in 1977, after which UNEP and the World Meteorological Organization (WMO) set up the Coordinating Committee of the Ozone Layer (CCOL) to periodically assess ozone depletion. Intergovernmental negotiations for an international agreement to phase out ozone depleting substances started in 1981 and concluded with the adoption of the Vienna Convention for the Protection of the Ozone Layer in March 1985. The Vienna Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of CFC production, and the exchange of information.

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in 16th September 1987 and came into force on 1st January 1989. It was designed so that the phase out schedules of ozone depleting substances could be revised on the basis of periodic scientific and technological assessments. The Protocol classified countries into Developed (Non-Article 5) and Developing (Article 5) classes based on their annual per capita consumption of controlled substances. The Developed countries with annual consumption of more than 0.3 Kg per capita were required to cease production and phaseout consumption of controlled substances in January 01, 1996.

The **Developing countries with annual consumption of less than 0.3 kg per capita of ODSs** were granted a **10 years grace** period to comply with the phase out targets in an orderly and economical way. The **United Arab Emirates** became a party to both the Vienna convention and the Montreal protocol in December 22, 1989 and is considered an **Article (5) country**.

This policy has been introduced to guide industries, traders, users and other activities toward the orderly phase out goal of ozone depleting substances in accordance with the schedule in Montreal Protocol in Annex 1 and the Adjustments in 2007 in Annex 2. It shall apply to occupier / operator of all premises in which ozone-depleting substances (ODSs) are imported, stored, traded and used in Dubai as listed in Annex 3

2.0 UAE Relevant Legislation

a) UAE Decree No. (13) of 1999 Concerning Handling of Ozone Depleting Substances (ODSs) which includes CFCs (11, 12, 113, 114, 115) and (R500 & 502) and Halons (1211, 1301, 2402).
b) UAE Decree No. (23) of 1999 Concerning the Establishment of a Permanent Committee to Regulate the Imports of ODSs in UAE.
c) UAE Ministerial Decree No. 33 of January 30, 2012 – Regulation for Handling and Use of HCFCs

3.0 Amendment to the Montreal Protocol

The London Amendment – 1990: this amendment introduced control measures for both production and consumption for three new groups of substances, namely other halogenated **CFCs (Annex B, Group I substances), Carbon Tetrachloride (Annex B, Group II) and Methyl Chloroform or 1,1,1-trichloroethane (Annex B, Group III)**.

The amendment further introduced **HCFCs (Annex C, Group I substances)**, but only required reporting of production and consumption data for the Annex and did not introduce control measures for the Annex Group.

Copenhagen Amendment, 1992: this amendment introduced control measures for consumption only for HCFCs (Annex C, Group I substances). The amendment further introduced control measures for both production and consumption for two new groups of substances, namely HBFCs (Annex C, Group II substances) and Methyl Bromide (Annex E, Group I).

Montreal Amendment, 1997: This is amendment include the phase-out of HCFCs in developing countries, as well as the phase-out of methyl bromide in developed and developing countries in 2005 and 2015, respectively. Also this amendment introduced the requirement for licensing systems to allow control and monitoring of trade in substances controlled under the protocol.

Beijing Amendment, 1999: this amendment introduced control measures for production for HCFCs (Annex C, Group I substances) and imposed restrictions on trade with non-Parties for these HCFCs. The amendment further introduced control measures for both production and consumption for one new group of substances, namely Bromochloromethane or BCM (Annex C, Group III substance).

Montreal Amendment, 2007- At the 19th Meeting of the Parties in Montreal on September 17-21, 2007, the Parties agreed to more aggressively phase out ozone-depleting hydrochlorofluorocarbons (HCFCs). The agreement to adjust the phase-out schedule for HCFCs is expected to reduce emissions of HCFCs to the atmosphere by 47 percent, compared to the prior commitments under the treaty over the 30-year period of 2010 to 2040. For the developing countries, the agreement means there will be about a 58 percent reduction in HCFCs emission over the 30 year period

4.0 General Requirements

4.1 The importation of controlled substances shall be subject to the following restrictions.

a) Only companies that are given approval and annual quotas by the UAE Ministry of Environment & Water (**MoEW**) are allowed to import controlled substances listed in **Annex 3**.

b) The UAE Port Authority or Customs shall not clear all shipments without an approved clearance from the Environmental Control Section (ECS) of Environment Department of Dubai Municipality.

c) The **E**nvironmental **P**lanning and **S**tudies **S**ection (EPSS) and **E**nvironment **C**ontrol **S**ection (ECS) of the Environment Department of Dubai Municipality shall approve and monitor the importation of other ODSs, unless restricted under new FEA directive to be implemented.

d) All importers must submit a quarterly report to the EPSS every 1st week of the next quarter of controlled substances brought into Dubai stating the quantities of imports and sales for users in product manufacturer, air conditioning, refrigeration, fire prevention and other usage of consumption

4.2 Re-export of all chlorofluorocarbons (CFCs) and Halons is totally banned in accordance with the UAE Decree No. 13 of 1999.

4.3 It is strictly prohibited from January 01, 2010 for the importation and sale of all CFCs and Halons including new appliances containing CFCs such as freezers, refrigerators, air conditioners, in products like aerosols, insulation boards, panels and pipe covers and in automobiles or truck air conditioning and refrigeration.

4.4 It is strictly prohibited to vent any controlled substances during maintenance work or similar activities in any equipment or facilities. The recovery, reclamation, recycling and re-use shall be a mandatory practice at all stages in the refrigeration and air conditioning industries and fire protection systems.

4.5 Any companies engage in servicing, maintenance and repair of air conditioning and refrigeration or fire protection must have certified service technicians and adequate equipment to recover and reclaim and/or recycle refrigerants and halons.

5.0 Implementation of this Policy

5.1 The **E**nvironmental **P**lanning and **S**tudies **S**ection (EPSS) of the Environment Department of Dubai Municipality and other concerned authorities shall orderly implement ODSs phase-out through the exercise of their statutory powers.

5.2 The (EPSS) and other concerned authorities as appropriate shall actively promote the systematic control of ozone depleting substances (ODSs) and encourage cooperative approach with the management of industry, workforce and community to achieve the timely and orderly phase out of ODSs.

5.3 All importers, traders and users of controlled substances shall be required to strictly comply with this policy to adopt the appropriate use and sale of alternative substances and implement recovery, reclamation, recycling and reuse practices.

5.4 Any recovered refrigerants, solvents, halons and similar substances that can be still reclaimed shall be reclaimed only with adequate reclaiming equipment or by a recognized company with adequate reclaiming facilities.

5.5 Any waste refrigerants, solvents, halons and other substances are considered controlled substances that shall be adequately handled and disposed in accordance with the MSDS instruction and issued DM Environment Department Circular or directive from concerned authorities.

5.6 Any occupier or owner of industrial, commercial or controlled activities found in violation or failure to comply with any provision of this guideline or decisions for the control and phase-out of ODS shall be liable to outright fine, penalty or trade license cancellation that maybe issued by the EPSS

6.0 Audit & Management Control

6.1 The EPSS shall promote ODSs control by encouraging the use of annual audits and development of phase-out management plans. The industry, traders, importers and other interested parties shall work coordinative with the EPSS to assist in the development of ODSs management plans.

6.2 The EPSS shall require occupiers of industrial premises or similar activities which utilize ODSs to prepare a sound management and strategic action plans for CFC phase out suggested in Annex 4 as general practical steps to phase-out the use of CFCs and other ODSs.

6.3 The EPSS shall prepare an annual inventory of ODSs, which are imported, traded, used, recovered, reclaimed and recycled in Dubai.

6.4 The EPSS in coordination with MoEW and other authorities as appropriate shall control the entry of controlled substances at any ports in Dubai.

7.0 Guidelines For Controlled Activities

The utilization of ozone depleting substances shall be controlled in accordance with this policy in any activities that includes but not limited to the following;

7.1 Refrigeration and Air Conditioning Facilities

a) All existing equipment or appliances for domestic, commercial and industrial refrigeration or air conditioning, automobile and truck air conditioning and refrigeration utilizing controlled substances listed in **Annex 3** shall be required to;

- Maintain leak free equipment and systems at all times
- Obtain substances from recognized suppliers in UAE or recycled sources
- Convert equipment to use internationally approved alternative refrigerants.

b) The venting or direct discharging of controlled refrigerants during equipment maintenance and repair is strictly prohibited. The recovery, reclamation, recycles and reuse of refrigerants shall be practiced at all times during repair and maintenance.

c) Any refrigeration and air conditioning equipment shall be provided with adequate refrigerant leak monitoring system and/or inspection procedure as follows;

Refrigerant Charge Size	Requirements
>20 to ≤ 90 kgs	Annual inspection
> 90 to ≤ 910 kgs	Quarterly inspection
≥ 910 kgs	Automatic leak detection

d) All existing equipment or facilities shall replace ODSs with alternative refrigerants having zero ozone depletion potential or low global warming potential.

e) All existing air conditioning and refrigeration system shall not be charged or re-charged with virgin CFCs after January 01, 2010.

f) All newly built domestic, commercial and industrial centralized air conditioning and refrigeration system or new automobile and trucks air conditioning shall not use CFCs by January 01, 2010, instead these shall use alternative refrigerants with zero ozone depletion potential or low global warming potential.

7.2 Fire Protection Systems

a) Alternative fire suppressant or extinguishing substances having zero or very low ozone depletion potential shall be used in newly built fire protection systems except in essential use as determine by Dubai Municipality or FEA of the Ministry of Environment and Water.

b) Existing halon fire extinguisher or protection systems shall be properly maintained leak free and in accordance with the general requirements below.

- The venting of halons shall not be allowed during repair and maintenance of fire protection system. All existing premises shall recover and send it to DM recognized Reclamation Company prior to recycle and re-use of halon.
- All portable halon filled cartridges or cylinders for fire extinguishers shall be periodically serviced only to qualified premises with halon recovery equipment.

- All premises with exiting halon fire extinguishing/protection systems shall have these periodically maintained and serviced by qualified companies and certified technicians to prevent leakage.

7.3 Foam and Foam Based Products Production

a) All CFCs and other substances with high ozone depletion potential shall not be used by January 01, 2010 in any foam and foam based products production or similar industries.
b) Alternative substances with low or zero ozone depletion potential shall be used as blowing agent in the manufacture of all types of foam, insulation materials and similar foam based products.

7.4 Cleaning and Degreasing

All occupier or premises engage in cleaning and degreasing activities using chlorinated or halogenated solvents shall strictly comply with the requirements that includes but not limited to the following;

a) All substances that are classified as high ozone depleting substances such as CFC-113, 111-Trichloroethane (also known as methyl chloroform), and carbon tetrachloride shall not be used from the dates stated below.

Table 1: Chlorinated Solvent Phaseout

Date	Controlled Substances
January 01,2010	CFCs and Carbon Tetrachloride (CTC) phased out
January 01,2015	Methyl Chloroform (MCF) phased out
	HCFC reduction by 10%
January 01,2020	HCFC reduction by 35%
January 01,2030	HCFCs phase out

b) The use of solvents in cleaning and degreasing operations produce volatile organic compounds (VOCs) that require to be controlled for the safety of the workers as well as protection of the air environment. The following shall be done to minimize the emission of VOCs;

- For non-vapor degreasers using volatile solvent, or solvent that is agitated, the cover should be a sliding, rolling or guillotine (bi-parting) type which can be opened and closed easily with one hand.
- For open-top vapor degreasers, the cover should be a sliding, rolling or guillotine (bi-parting) type which can be opened and closed easily without disturbing the vapor zone.
- For conveyor degreasers, an enclosed cover shall be provided except for work load entrances and exits that shall be equipped with covers for closing off during shutdown hours.

c) Any industry using the controlled substances shall prepare an inventory and phase-out program in order to comply with the phase out schedule as shown in Annex 1. The inventory and phase out program must be submitted to Environmental Planning and Studies Section (EPSS) for review, evaluation and documentation.

d) Industries should first examine whether there is a need to clean items at all and whether water based caustic substances can be used before considering vapour and non-vapour solvent degreasing and cleaning systems.

e) Owners of existing equipment shall investigate alternatives and inform the EPSS of the selected alternative and the deadline for decommissioning all equipment and process utilizing controlled substances.

f) Available alternatives or technologies to chlorinated solvents for cleaning and degreasing includes but not limited to the following**;**

- **Aqueous Systems**

  Aqueous cleaners are mixtures of water, detergents, and other additives that promote the removal of organic and inorganic contaminants from hard surfaces. Each component of an aqueous cleaner performs a distinct function and affects the way the contaminant is removed from a substrate.

- **Semi-Aqueous Systems**

  Semi-aqueous cleaners comprise a group of cleaning solutions that are composed of natural or synthetic organic solvents, surfactants, corrosion inhibitors, and other additives. The commonly used semi-aqueous cleaners include water-immiscible types (terpenes, high-molecular-weight esters, petroleum hydrocarbons, and glycol ethers) and water-miscible types (low-molecular-weight alcohols, ketones, esters, and organic amines).

- **Dry Ice Blasting**

  This technology uses solid pellets of carbon dioxide (dry ice) as a blasting medium for cleaning metal parts. There's no polluting emissions released since dry ice pellets disintegrate upon impact and dissipate to the atmosphere. It does not generate wastewater. As a result, no solvent waste is generated and to be disposed.

- **Vacuum De-Oiling**

  Vacuum de-oiling is an operation that removes surface oils from parts without using ozone-depleting or hazardous chemicals, water or detergents. Thermal and vacuum technology removes the oil residue on parts through vaporization. The vapors are condensed and collected for reprocessing or recycling

- **Non- Aqueous Solvents**
  - **Hydrocholorofuorocarbons Solvents (HCFCs)**

    The HCFC-225ca and HCFC 225cb seem that the physical properties are remarkably similar to those of CFC-113 in most respects. Their ODPs have been calculated as fairly low, certainly less than 0.1, possibly even 0.05. Other possible HCFCs include HCFC-141b and HCFC-123. These have estimated ODPs of 0.08 - 0.15 and 0.02 -0.05 respectively. These substances are to be phase-out by January 1, 2030.

- **Fluorinated Solvents**

  Hydrofluorocarbons (HFCs) seem reasonable as fluorocarbons have a very small light reactivity and hydrofluoprocarbons mostly breakdown in the troposphere. HFCs have been proposed to dilute other solvents in order to allow blend to approach more suitable characteristics for specific cleaning applications to render it more inert or to artificially lower the ODP. The pentafluoropropanol may have useful characteristics for degreasing delicate parts.

- **Chlorinated Solvents**

  Solvents with low ODPs such as perchloethylene (PCE) or tetrachloroethylene are commonly used in dry cleaning while the trichloroethylene (TCE) 1,1,1-trichloroethane (TCA), and PCE are used as degreasing solvents.

- **Petroleum Hydrocarbons**

  Light hydrocarbons are toxic and flammable. Heavier hydrocarbons with higher flash and boiling points can also be quite effecient solvents if handled correctly. Their low vapor pressure which renders them safer to use but makes drying problematic.

- **Alcohol and other hydrocarbon derivatives**

  Alcohols are excellent solvents for many applications, including certain de-fluxing operations. However, it require precautions to be taken before it can be used for large scale industrial cleaning since these are flammable with flash points between 12°C and 15°C. Alcohols are smog precursor that some controls may be applied to their emissions.

7.5 Aerosol sprays

a) Aerosols that contain ozone-depleting substances shall not be allowed to be imported and traded in Dubai from January 01, 2010, except approved items for medical or other essential uses as determine by the Environment Department.

b) Aerosol manufacturers shall not be allowed to use all types of controlled or prohibited substances as propellants after January 01, 2010 unless it is covered under exemptions.

For further information, please visit Dubai Municipality website www.dm.gov.ae

or contact the Environmental Planning & Studies Section

at Tel. No: 046066757, Fax: 047033565

Annex 1 - Table 1: Phase out Schedule Agreed in 9th Meeting of the Parties Montreal, 15-17 September 1997

[The Non-Article 5 (Developed) Countries are indicated by " ∗ " (Asterisk)]
[The Article 5 (Developing) Countries are in **Bold Letters** and indicated by " • " (Dot)]

Date	Control Measures
July 01, 1989	∗Freeze of Annex A[(1)] CFCs
January 01,1992	∗Freeze of Halons
January 01,1993	∗Annex B CFCs [(2)] reduced by 20% from 1989 levels ∗Freeze of Methyl Chloroform
January 01,1994	∗Annex B CFCs reduced by 75% from 1989 levels ∗Annex A CFCs reduced by 75% from 1986 levels ∗Halons [(3)] phase out [(6)] ∗Methyl Chloroform reduced by 50%
January 01,1995	∗Methyl Bromide frozen at 1991 levels ∗Carbon Tetrachloride reduced by 85% from 1989 levels
January 01,1996	∗HBFCs [(6)] phased out [(4)] ∗Carbon Tetrachloride phase out [(6)] ∗Annex A and B CFCs phased out[(6)] ∗Methyl Chloroform phase out[(6)] ∗HCFCs[(5)] frozen at 1989 levels of HCFC +2.8% of 1989 consumption of CFCs (base level)
January 01,1999	∗Methyl Bromide reduced by 25% from 1991 levels
July 01, 1999	•**Freeze of Annex A CFCs at 1995-1997 average levels**[(7)]
January 01,2001	∗Methyl Bromide reduced by 50% from 1991 levels
January 01, 2002	•**Freeze of Halons at 1995-1997 average levels**[(7)] •**Freeze of Methyl Bromide at 1995-1998 average levels**
January 01,2003	∗Methyl Bromide reduced by 70% from 1991 levels •**Annex B CFCs reduced by 20% from 1998-2000 average consumption**[(8)] •**Freeze in Methyl Chloroform at 1998-2000 average levels**
January 01,2004	∗HCFCs reduced by 35% below base levels
January 01,2005	∗Methy Bromide phase out •**Annex A CFCs reduced by 50% from 1995-1997 average levels**[(7)] •**Halons reduced by 50% from 1995-1997 average levels**[(7)] •**Carbon Tetrachloride reduced by 85% from 1998-2000 average levels** •**Methyl Chloroform reduced by 30% from 1998-2000 average levels**
January 01,2007	•**Annex A CFCs reduced by 85% from 1995-1997 average levels**[(7)] •**Annex B CFCs reduced by 85% from 1998-2000 average levels**[(8)]
January 01,2010	∗HCFCs reduced by 65% •**CFCs, Halons and Carbon Tetrachloride phased out** •**Methyl Chloroform reduced by 70% from 1998-2000 average levels**
January 01,2015	∗HCFCs reduced by 90%

	•**Methyl Chloroform phased out** •**Methyl Bromide phase out**
January 01,2016	•**Freeze of HCFCs at base line figure of year 2015 average levels**
January 01,2020	∗HCFCs phase out allowing for a service tail of up to 0.5% until 2030 for existing refrigeration & air conditioning equipment
January 01,2040	•**HCFCs phase out**

Footnotes:
(1) Five(5) CFCs in Annx A: CFCs 11,12,113,114 and 115
(2) Ten (10) CFCs in Annex B: CFCs 13,111,112,211,212,213,214,215,216, and 217
(3) Halons 1211, 1301, and 2402
(4) Thirty four (34) Hydrobromofluorocarbons
(5) Thirty four (34) Hydrochlorofluorocarbons
(6) With exemption for essential uses. Consult the Handbook on Essential Use Nominations prepared by the Technology and Economic Assessment Panel,1994,UNEP for more information
(7) Calculated level of production of 0.3 Kg/capita can also be used for calculation,if lower
(8) Calculated level of production of 0.2 Kg/capita can be also be used for calculation,if lower

Annex 2 - Table 2: 2007 Montreal Adjustment on Production and Consumption of HCFCs

1. Comparison of old and new commitments

At their 19th Meeting of the Parties to the Montreal Protocol (September 17-21 2007), the Parties agreed to adjust their commitments related to the phase out of HCFCs. What follows is a comparison of the past HCFC control commitments of non-Article 5 (developed country) Parties and Article 5 (developing country) Parties with those agreed at the 19th Meeting.

Non Article 5 Parties Existing Commitments	Non Article 5 Committments Under the 2007 Montreal Adjustment
Baseline: 2.8% of 1989 CFC levels plus 100% of 1989 HCFC levels	Unchanged
Freeze in 1996	Unchanged
35% reduction by 2004	Unchanged
65% reduction by 2010	75% reduction by 2010
90% reduction by 2015 (Consumption only)	90% reduction by 2015
99.5% reduction by 2020*	Unchanged
Phase out by 2030	Unchanged

* 0.5% is restricted to the servicing of refrigeration and airconditioning equipment existing during the period 2020-2030 and subject to review in 2015

Article 5 Parties Existing Commitments	Article 5 Commitments Under the 2007 Montreal Adjustment
Baseline: 2015 levels	Average of 2009 and 2010 production and consumption
Freeze by 2016	Freeze by 2013
No obligation	10% reduction by 2015
No obligation	35% reduction by 2020
No obligation	67.5% reduction by 2025
No obligation	100% reduction by 2030*

*the annual average of 2.5% is restricted to the servicing of refrigeration and air conditioning equipment existing on 1 January 2030 for the period 2030-2040 and subject to review in 2015.

2. Process for entry into force of the 2007 Montreal Protocol Adjustment

In accordance with the procedure laid down in paragraph 9 of Article 2 of the Montreal Protocol, the Depositary communicated the adjustments to all Parties on 14 November 2007. The adjustments shall enter into force and become binding to all Parties on the expiry of six months from the date of the communication by the Depositary

Annex 3: Table 3: List of Substances that Deplete the Ozone Layer

Annex A Group I (CFCs)		
Name	**Chemical Name**	**ODP***
CFC 11 ($CFCl_3$)	Trichlorofluoromethane	1.0
CFC 12 (CF_2Cl_2)	Dichlorodifluoromethane	1.0
CFC 113 ($C_2F_3Cl_3$)	Trichlorotrifluoromethane	0.8
CFC 114 ($C_2F_4Cl_2$)	Dichlorotetrafluoroethane	1.0
CFC 115 (C_2F_5Cl)	Chloropentafluoroethane	0.6
Annex A Group II (Halons)		
Halon 1211(CF_2BrCl)	Bromochlorodifluoromethane	3.0
Halon 1301(CF_3Br)	Bromotrifluoromethane	10.0
Halon 2402 ($C_2F_4Br_2$)	Dibromotetrafluoroethane	6.0
Annex B Group I (CFCs)		
CFC 13 (CF_3Cl)	Chlorotrifluoromethane	1.0
CFC 111 (C_2FCl_5)	Pentachlorofluoroethane	1.0
CFC 112 ($C_2F_2Cl_4$)	Tetrachlorodifluoroethane	1.0
CFC 211 (C_3FCl_7)	Heptachlorofluoropropane	1.0
CFC 212 ($C_3F_2Cl_6$)	Hexachlorodifluoropropane	1.0
CFC 213 ($C_3F_3Cl_5$)	Pentachlorotrifluoropropane	1.0
CFC 214 ($C_3F_4Cl_4$)	Tetrachlorotetrafluoropropane	1.0
CFC 215 ($C_3F_5Cl_3$)	Trichloropentafluoropropane	1.0
CFC 216 ($C_3F_6Cl_2$)	Dichlorohexafluoropropane	1.0
CFC 217 (C_3F_7Cl)	Chloroheptafluoropropane	1.0
Annex B Group II (Carbon tetrachloride)		
CCl_4	Carbon tetrachloride	1.1
Annex B Group III (Methyl chloroform)		
$C_2H_3Cl_3$	1,1,1-trichloroethane	0.1
Annex C Group I (HCFCs)		
Formula	**Chemical Name**	**ODP**
$CHFCl_2$	HCFC 21	0.04
CHF_2Cl	HCFC 22	0.055
CH_2FCl	HCFC 31	0.02
C_2HFCl_4	HCFC 121	0.01 - 0.04
$C_2HF_2Cl_3$	HCFC 122	0.02 - 0.08
$C_2HF_3Cl_2$	HCFC 123	0.02 - 0.06
C_2HF_4Cl	HCFC 124	0.02 - 0.04
$CHFClCF_3$	HCFC 124	0.022
$C_2H_2FCl_3$	HCFC 131	0.007-0.05
$C_2H_2F_2Cl_2$	HCFC 132	0.008-0.05
$C_2H_2F_3Cl$	HCFC 133	0.02 -0.06
$C_2H_3FCl_2$	HCFC 141	0.005-0.07

Annex C Group I (HCFCs) …continued		
Formula	**Chemical Name**	**ODP***
$C_3H_2F_3Cl_3$	HCFC 233	0.007-0.23
$C_3H_2F_4Cl_2$	HCFC 234	0.01-0.28
$C_3H_2F_5Cl$	HCFC 235	0.03-0.52
$C_3H_3FCl_4$	HCFC 241	0.004-0.09
$C_3H_3F_2Cl_3$	HCFC 242	0.005-0.13
$C_3H_3F_3Cl_2$	HCFC 243	0.007-0.12
$C_3H_3F_4Cl$	HCFC 244	0.009-0.14
$C_3H_4FCl_3$	HCFC 251	0.001-0.01
$C_3H_4F_2Cl_2$	HCFC 252	0.005-0.04
$C_3H_4F_3Cl$	HCFC 253	0.003-0.03
$C_3H_5FCl_2$	HCFC 261	0.002-0.02
$C_3H_5F_2Cl$	HCFC 262	0.002-0.02
C_3H_6FCl	HCFC 271	0.001-0.03
Annex C Group II (HBFCs)		
Formula	**Chemical Name**	**ODP**
$CHFBr_2$		1.0
CHF_2Br	HBFC-22B1	0.74
CH_2FBr		0.73
C_2HFBr_4		0.3 - 0.8
$C_2HF_2Br_3$		0.5 - 1.8
$C_2HF_3Br_2$		0.4 - 1.6
C_2HF_4Br		0.7 - 1.2
$C_2H_2FBr_3$		0.1 - 1.1
$C_2H_2F_2Br_2$		0.2 - 1.5
$C_2H_2F_3Br$		0.7 - 1.6
$C_2H_3FBr_2$		0.1 -1.7
$C_2H_3F_2Br$		0.2 - 1.1
C_2H_4Br		0.07 - 0.1
C_3HFBr_6		0.3 - 1.5
$C_3HF_2Br_5$		0.2 - 1.9
$C_3HF_3Br_4$		0.3 - 1.8
$C_3HF_4Br_3$		0.5 - 2.2
$C_3HF_5Br_2$		0.9 - 2.0
C_3HF_6Br		0.7 - 3.3
$C_3H_2FBr_5$		0.1 - 1.9
$C_3H_2F_3Br$		30.2 - 5.6
$C_3H_2F_4Br_2$		0.3 - 7.5
$C_3H_2F_5Br$		0.9 - 1.4

CH_3CFCl_2	HCFC 141b	0.11
$C_2H_3F_2Cl$	HCFC 142	0.008-0.07
CH_3CF_2Cl	HCFC 142b	0.065
C_2H_4FCl	HCFC 151	0.003-0.005
C_3HFCl_6	HCFC 221	0.015-0.07
$C_3HF_2Cl_5$	HCFC 222	0.01 - 0.09
$C_3HF_3Cl_4$	HCFC 223	0.01 - 0.08
$C_3HF_4Cl_3$	HCFC 224	0.01 - 0.09
$C_3HF_5Cl_2$	HCFC 225	0.02 - 0.07
$CF_3CF_2CHCl_2$	HCFC 225ca	0.025
CF_2ClCF_2CHClF	HCFC 225cb	0.033
C_3HF_6Cl	HCFC 226	0.02-0.10
$C_3H_2Cl_5$	HCFC 231	0.05-0.09
$C_3H_2F_2Cl_4$	HCFC 232	0.008-0.10

$C_3H_3FBr_4$		0.08 - 1.9
$C_3H_3F_2Br_2$		0.1 - 3.1
$C_3H_3F_3Br_2$		0.1 -2.5
$C_3H_3F_4Br$		0.3 - 4.4
$C_3H_4FBr_3$		0.03 - 0.3
$C_3H_4F_2Br_2$		0.1 - 1.0
$C_3H_4F_3Br$		0.07 - 0.8
$C_3H_5FBr_2$		0.04 - 0.4
$C_3H_5F_2Br$		0.07 - 0.8
C_3H_6FBr		0.02 - 0.7

Annex E Group I (Methyl bromide)

Formula	Chemical Name	ODP
CH_3Br	Methyl bromide	0.6

***ODP** – means ozone depletion potentials

Annex 4: List of Products Containing Controlled Substances Specific in Annex A which was adopted by the Third Meeting of Parties in Nairobi, 21 June 1991 as required by paragraph 3 of Article 4 of the Protocol.

1. Automobile and truck air conditioning units (whether incorporated in vehicles or not)
2. Domestic and commercial refrigeration and air conditioning/heat pump equipment such as refrigerators, freezers, dehumidifiers, water coolers, ice making machines,air conditioning and heat pump units containing controlled substances as a refrigerant and/or in insulating material of the product.
3. Aerosol products except medical aerosols
4. Portable fire extinguishers
5. Insulation boards, panels and pipe covers
6. Pre-polymers

Annex 5 - Table 4: Suggested Practical Steps to Phaseout the Use of CFCs or ODSs

Step 1: Establish the Framework 1. Obtain a firm commitment from the management responsible for administration and services 2. Allocate responsibility • Ensure that a senior manager with appropriate technical and organizational skills takes responsibility for the project 3. Set up the team • For site maintenance; Purchasing; Local supplying companies with technical expertise in refrigeration and air conditioning 4. Prepare a preliminary budget for labour, equipment and service personnel
Step 2: Identify CFCs Using Equipment and CFCs in Use 1. Survey the equipment on site • Refrigerating and freezing units • Fixed air conditioning systems • Mobile air conditioning system • Fire fighting equipment 2. Obtain details of equipment which is not regularly serviced • Identify type of CFCs and quantity and age of equipment • Obtain details of CFCs used and equipment which is regularly serviced and age of equipment
Step 3: Choose the Appropriate Option and Prepare Action Plan for the Phaseout 1. The choose of replacement will depend on 2 factors; • Type of equipment • Type of CFCs or ODSs
Step 4: Review Progress of Action 1. Conduct periodic review of phaseout progress with report to person with overall sponsibility • Leak test equipment • No action to be taken until the equipment fails or leaks • Equipment recommended for continued servicing with recycled CFCs • Refrigerant scheduled for replacement by zero ODP or low ODP alternative • Equipment scheduled for retrofit or replacement
Step 5: Keep New Equipment or Appliances CFC Free • Purchased new equipment or appliances using zero ODP refrigerants, air conditioning fluids and fire extinguishers

Annex 6 - Definition of Terms

Appliance: Any device which contains and uses a Grooup I (CFC) or Group II (HCFC) substance as a refrigerant and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller or freezer.

Chlorofluorocarbons (CFCs): CFCs were invented in 1928. They are colorless, odorless, non-toxic chemicals and nonflammable. They vaporize easily at low temperatures making them ideal coolants in refrigerators and air conditioners. CFCs are also used in making foam for seat padding and insulation, until recently they were used extensively in aerosol spray cans. CFCs have caused the most ozone destruction because of their low cost and widespread use.

Halons: Acompound, which contain bromine, are very effective in putting out fires. They become widely used from the mid-1970s and are commonly found in yellow fire extinguishers. Halons have not been used as extensively as CFCs, but are much more destructive.

Methyl bromide: A chemical used to fumigate soil, crop products and for plant quarantine to destroy insects and pests.

Methyl chloroform: Is a versatile all-purpose solvent which is widely used as industrial solvent for cleaning metal parts during the manufacture of equipment.

Carbon tetrachloride: A traditional solvent once used by dry cleaners, but now used mainly in chemistry laboratories. It is toxic and causes cancer.

Hydrochlorofluorocarbon (HCFC): These chemicals have similar properties to halons and CFCs, but they are not as damaging to the ozone layer. They are being used by some industries as a step in the transition to substances that do not destroy ozone.

Major maintenance, service, or repair: Maintenance, service or repair that involves removal of the appliance compressor, condenser, evaporator or auxilliary heat exchanger coil

Ozone: Ozone is a molecule containing three oxygen atoms (O3) instead of the normal two (O2). It is present in the upper atmosphere as well as on the earth' surface. The ozone, which is

found in the stratosphere between 10 to 50 Km from the earth's surface, is called the ozone layer.

Reclaim: To re-process refrigerant to at least the purity speicified in the ARI (Air conditioning and Refrigeration Institute) Standatrd 700-1993, Specifications for Fluorocarbon Refrigerants and to verify this purity using the analytical methodology prescribed in the Standard. Reclamation requires specialized machinery not available at a particular job site or auto repair shop. The technician will recover the refrigerant and then send it either to a general reclaimer or back to the refrigerant manufacturer.

Recover: To remove refrigerant in any condition from an appliance and store it in an external container without necessarily testing or processing it in any way.

Recycle: To extract refrigerant from an appliance and clean refrigerant for re-use without meeting all of the requirements for reclamation. In general, recycled refrigerant is a refrigerant that is cleaned using oil separation and single or multiple passes through devices, such as replaceable core filter-driers, which reduce moisture, acidity, and particulate matter.

Venting: Any service, maintenance, or repair on an appliance that would release refrigerants to the atmosphere unless the refrigerant recovered previously from the appliance. Connecting and disconnecting hoses and gauges to and from the appliance to measure pressures within the appliance or to add refrigerant to or recover refrigerant from the appliance shall not be considered "venting".

Disclaimer

The information provided on our website is for general information purposes only. While WKC endeavours to provide the most up to date and accurate information, documents and links on our website, we will not be held liable for any loss or damage including without limitation, indirect or consequential loss or damage, or any loss or damage whatsoever arising from the use any of the information provided on our website. For any queries regarding the information on our website, please contact us on enquiries@wkcgroup.com.