



Cooling without CFCs: An Action Guide



Starting from 1 January 1996, the import of chlorofluorocarbons (CFCs) into Hong Kong were prohibited. This significant step to protect the ozone layer has major implications for you as owners and managers of air-conditioning equipment. Rising costs and shortages of CFC refrigerants can be expected. Banning the import of CFCs does not mean that you have to stop operating equipment that run on CFC refrigerants immediately after 1995. Instead, you should take immediate action to contain, conserve and recycle refrigerants. This guide provides important background information and suggestions for you to cope with the CFC phaseout.

CFC Refrigerants and the Ozone Layer

In Hong Kong, many large central air-conditioning systems, retail food refrigeration units, car air-conditioner and cold storage warehouses are operating on CFC refrigerants. The most commonly used CFC refrigerants are R-11 and R-12. During the use, maintenance and disposal of these equipment, CFC refrigerants will leak out into the atmosphere and contribute to the destruction of the ozone layer which shields against the harmful ultraviolet (UV) radiation from the sun. A depleted ozone layer allows more UV radiation to reach the Earth's surface, where they could cause higher rates of skin cancer and cataracts. Also, excessive UV radiation could damage food crops and marine ecosystems.

Phasing out CFCs

More than 130 countries have signed an international treaty, known as the *Montreal Protocol*, to protect the Earth's ozone layer. To fulfill its obligations, Hong Kong enacted the Ozone Layer Protection Ordinance in 1989 which prohibits the manufacturing of ozone depleting substances (ODS) including CFCs and halons, and which imposes controls on the import and export of these substances. Also, in line with the *Protocol*, the CFC refrigerants that were banned from import at the end of 1995 include: R-11, R-12, R-13, R-113, R-114, R-115, R-500, R-502, and R-503. Two replacements for CFCs, i.e. HCFC-22 and HCFC-123, are expected to be phased out within 30 years.

The Ozone Layer Protection (Controlled Refrigerants) Regulation, made under the Ordinance, prohibits the release of CFC refrigerants during the service, maintenance and disposal of air-conditioning equipment. To recover the R-11, R-12, R-500 and R-502 used in air-conditioning and refrigeration systems, it is required by law to use approved recovery and recycling equipment.

Phasing in CFC Alternatives

Alternative refrigerants, retrofit parts, and new equipment are now available for all commercial air-conditioning equipment. Equipment owners should consult the manufacturer or supplier when making decision.

How to reduce dependence on CFCs for air-conditioning ?

Although there is no single best approach to the transition from CFC refrigerants to substitutes, it is clear that **the worst action is no action**. There are two steps that owners and managers can take immediately:

a. Conduct an Inventory of Equipment and Refrigerants

Detailed records of equipment and refrigerant inventories are essential for making decisions about the transition to new refrigerants. Priority should be given to equipment with the largest charge. Information is needed on the manufacturer, model serial number, year installed, cooling capacity, refrigerant content, annual consumption of refrigerant (based on records of recharging or "topping up"), refrigerant type (CFCs, HCFCs, and HFCs), and location. The refrigerant quantity purchased, consumed, disposed of or recycled should be monitored and analysed. These inventories should be updated regularly.

b. Develop a Refrigerant Management Plan

The chiller owners and managers should develop a refrigerant management plan to determine how to maintain, convert or replace each piece of CFC equipment after analysing the choices, cost etc. A good refrigerant management plan is based on accurate equipment and refrigerant inventories and takes account of the unique business environment. The plan will help to minimize capital outlays and operating costs, as well as continued supplies and service. The plan should also consist of the following action:

- *Maintaining Existing Equipment*

Conserving CFCs through routine leak checks, leak detection, equipment repairs, refrigerant recovery, and installation of high-efficiency air purges for low pressure centrifugal machines (i.e. those using CFC-11) are very important. Reliance on recycled or reclaimed refrigerants to maintain existing equipment, however, is most viable with large equipment inventories where units can be gradually retired to keep others going.

- *Retrofitting Equipment to Alternative Refrigerants*

The best solution for equipment with a long remaining life is likely to be its conversion for use with substitute refrigerants. Scheduling retrofits at the time of servicing or major equipment overhauls will keep costs down and minimise the unnecessary disruption. Consult equipment manufacturers or suppliers for information on special design requirements (such as compatibility of materials and lubrication) and the analysis of the energy and capacity trade-offs of retrofitting.

- *Replacing Old or Inefficient Equipment*

Replacing aging equipment can improve energy efficiency and performance. This option has the highest initial cost, but eventually yields savings in energy, maintenance, and refrigerant costs. Only non-CFC equipment should be purchased.

Consideration of the following factors will be useful in deciding whether to maintain, retrofit or replace each piece of CFC equipment:

- age and remaining life of existing equipment;
- hours of usage;
- maintenance and repair history;
- refrigerant and equipment supply and possible alternatives;
- energy and capacity trade-offs; and
- equipment upgrades.



CFC Phaseout and Your Vehicle : A Consumer Guide

This pamphlet is prepared to help you, as the owner or prospective owner of an air-conditioned car or truck, to understand how efforts to protect the ozone layer will affect you and your vehicle now and in the future.

Our Depleted Ozone Layer

Before you turn on the air-conditioner in your vehicle, stop and think about the last time it was serviced. Leaky system and careless service practice can lead to the release of refrigerant known to be destructive to the ozone layer. Proper maintenance and routine checkups of air-conditioners and other appliances with refrigerant will help reduce this problem.

Scientists worldwide have concluded that chloro-fluorocarbons (CFCs, also known by the trade name Freon) deplete the ozone layer. CFCs have been used in the manufacturing of various products, such as foam insulation, electronics equipment, refrigerators and air-conditioners. When allowed to escape, these chemicals drift some 16 km to 50 km up above the Earth to the stratospheric ozone layer which screens us from the sun's powerful ultraviolet (UV) radiation. Once there, CFCs break apart and release chlorine, which then attack ozone. A single chlorine atom can destroy more than 100 thousand ozone molecules.

A depleted ozone layer allows more UV radiation to reach the Earth's surface, where they could cause higher rates of skin cancer and cataracts. Also, excessive UV radiation could damage food crops and marine ecosystems.

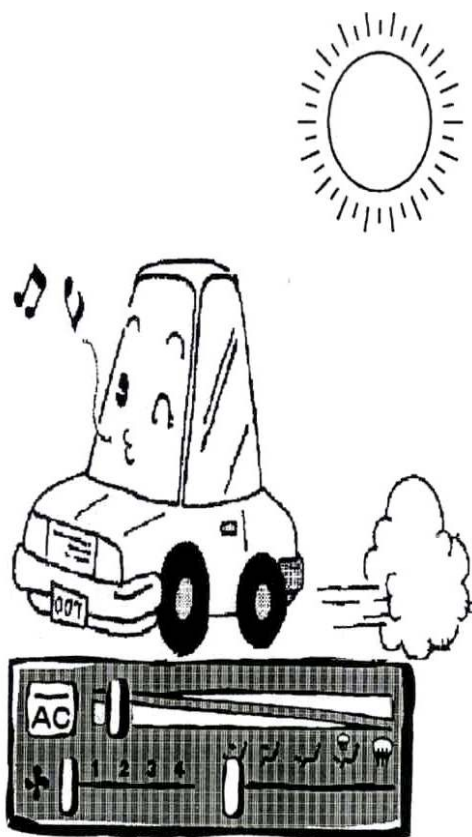
Protecting the Ozone Layer

More than 130 countries have signed an international treaty, known as the *Montreal Protocol*, to protect the Earth's ozone layer. Recognising the concerns of the international community on these ozone depleting substances (ODS), the Hong Kong Government enacted the Ozone Layer Protection Ordinance in 1989, which prohibits the manufacturing of ODS and imposes controls on the import and export of these substances. Also, in line with the *Montreal Protocol*, a total ban on import of CFCs takes effect in Hong Kong on 1 January 1996.

The Ozone Layer Protection (Controlled Refrigerants) Regulation, made under the Ordinance, prohibits the release of CFC refrigerants during the service, maintenance, and disposal of air-conditioning and refrigeration equipment. To recover the CFC-12 used in vehicles, service centres/garages are required by law to use approved recovery and recycling equipment when servicing car air-conditioning systems.

You can help save the ozone layer by getting service centre/garage which uses recycling equipment to service the air-conditioner in your vehicle and by having leaking systems repaired. Recycling and leak repair help to conserve CFCs and limits the release of the chemical to the environment.

All vehicle manufacturers are responding to the CFC production phaseout by producing vehicles with an alternative refrigerant called HFC-134a. This refrigerant does not deplete the ozone layer because it does not contain chlorine. By the end of 1993, virtually all new cars, trucks and vans were equipped with HFC-134a air-conditioning systems.



CFC Phaseout and Your Vehicle

In Hong Kong, CFC phaseout means that the import of CFCs are prohibited starting from 1996, but it does not mean that you have to stop using or having your vehicle air-conditioner serviced with CFC-12. While the available supply of CFC-12 is reducing, many vehicle owners will still be able to have their vehicle air-conditioning units serviced with CFC-12 in the near future. Here are some important points to bear in mind as the stock of CFC-12 is running out.

Reduce unnecessary loss of refrigerant

Preventive maintenance, fixing leaks, and recycling at service are key actions to minimise the need for additional CFC-12 refrigerant.

Use only appropriate alternative refrigerant

All vehicles that were designed for CFC-12 refrigerant should continue to use CFC-12 when serviced, unless the air-conditioning system is retrofitted to accept the HFC-134a as an alternative refrigerant. Using substances that have not been thoroughly tested may cause performance and safety problems and can void your warranty.

Consider retrofitting

Most car air-conditioners sold prior to 1993 were designed to use CFC-12, but can be retrofitted to use a non-ozone depleting refrigerant. The decision to switch is yours. A good time to retrofit might be when you have major service done on your CFC-12 air-conditioner. Since the complexity and the cost of retrofitting a CFC-12 system will vary by vehicle make, model and age, the decision to retrofit may make more sense for some vehicles than others. For vehicles under warranty, please consult your local dealer.

Have your car air-conditioning system properly serviced

Refrigerant must not be "vented" during servicing of car air-conditioners as it is an offence under the law. Before agreeing to servicing, ask if the service centre/garage will use refrigerant recovery equipment if the refrigerant inside the air-conditioner needs to be removed.

Follow recommended procedures

Vehicle manufacturers are working diligently to identify the retrofit procedures for each of their models that would permit the use of HFC-134a while maintaining reliability and cooling performance. If you choose to retrofit, make sure that your service centre/garage uses the manufacturer's recommended alternative refrigerant and follows its recommended procedures.

Buying a vehicle?

Ask if the air-conditioner uses HFC-134a, and if not, find out about any applicable warranties covering air-conditioning service and repair. If you buy an extended warranty or service contract, you need to find out whether it covers future air-conditioning repairs or services.

Environmental Protection Department and the automobile industry, are working together to achieve a smooth transition to the non-CFC refrigerant, but we need your support and cooperation to make this effort a success.



Refrigeration, Life After CFC Phaseout

QUESTIONS & ANSWERS

Q: How will the import ban on CFCs affect me?

A: The import ban on CFCs takes effect on 1 January 1996, this means that Hong Kong will no longer be allowed to import CFC refrigerants. You will still be allowed to use CFCs in your equipment, but over time the availability of CFC refrigerants will likely decrease and their costs increase. The next time you have your refrigeration equipment serviced would be a good time to consider switching to one of the alternative refrigerants now widely available for use in existing equipment. Gradually, the alternatives are becoming cheaper than the CFC refrigerants.

Q: How do I get ready for the CFCs import ban ?

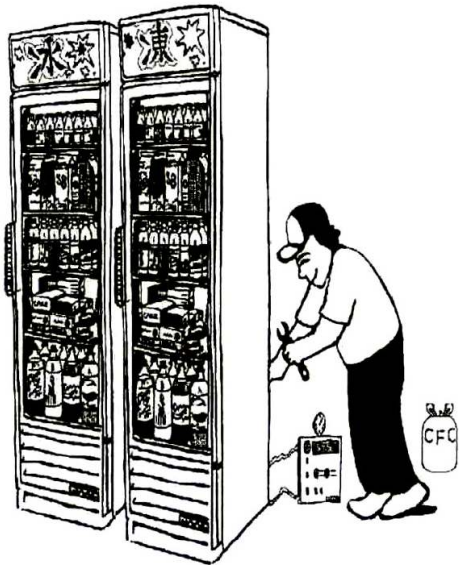
A: Start by developing a plan. This plan could be as simple as a table listing each unit, the type of refrigerant, age, anticipated replacement date and type of refrigerant to be used during retrofit (if unit is not to be replaced soon). Check with your service contractor as well as your equipment and refrigerant manufacturers for recommendations. Then be prepared to take advantage of routine servicing to perform the retrofits or to replace equipment with non-CFC equipment when it is near the end of its useful life.

Q: What are my options for managing the CFC phaseout ?

A: You have three basic options. You can take steps to recycle refrigerants as you service your equipment, so that you can keep your existing equipment operating as long as possible. Remember, of course, that CFC refrigerant supplies will keep dwindling. Or, you can retrofit your existing equipment so that you are able to use the new alternative refrigerants. Finally, you can retire equipment that is near the end of its life and replace it with non-CFC equipment. Replacement can reduce operating costs if new energy-efficient equipment is selected.

Q: When is the best time to switch to the alternative refrigerants ?

A: When to switch is up to you. You can move to the alternative refrigerants all at one time or in stages. It is important, however, that you have a plan for making this transition. The best time to switch may be during the next routine scheduled servicing. Do not wait to make the change during emergency servicing, by doing so may lead to problems and will almost certainly cost you more money.



Q: How to choose alternative refrigerants?

A: For converting or replacing CFCs equipment, two kinds of alternative refrigerants are now available: hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). HFC-134a, HFC blends, and HCFC-22 are used in both conversions and new equipment. HCFC blends are generally used only in conversions. Ammonia is also an option for new equipment where safety standards set by the Fire Services Department are fulfilled. Which substitute is appropriate for your equipment will depend on the type of equipment you have and its operational requirements. Check with your equipment manufacturer and service contractor to make the decision that is right for your equipment. The changes involved in shifting to an alternative may be limited to changing oil or may include replacing gaskets, valves or other components. Recommended procedures now exist for most equipment.

Q: Why are CFCs and other ozone depleting chemicals creating a global problem?

A: The ozone layer is a band of gas 16-50 km above the Earth that protects us from the sun's harmful ultraviolet (UV) radiations. Refrigerants containing chlorofluorocarbons (CFCs) are harmful to the ozone layer when they leak out of equipment or are vented. These chemicals are carried into the upper atmosphere by the wind where they release chlorine atoms which destroy ozone molecules. A damaged ozone layer allows more UV radiations to reach the Earth's surface, where they can cause higher rates of skin cancer, eye damage, and weakened immune systems. Excessive UV exposure can also harm crops and ocean life.

Q: Where can I get additional information?

A: Start by calling the manufacturers of your existing equipment for guidance of how to convert existing equipment and performance information about the new refrigerants. Talk to your service contractor about the alternatives, and get another opinion if you are in doubt.

CHECKLIST OF ACTIONS YOU NEED TO TAKE ...

For equipment owners:

- ◆ Consider shifting to an alternative refrigerant the next time servicing occurs;
- ◆ Develop a retrofit / replacement plan;
- ◆ Make sure your service contractor is using approved recovery and recycling equipment;
- ◆ Repair leaks in equipment to reduce unnecessary loss of refrigerant; and
- ◆ Maintain service records for equipment with a refrigerant charge greater than 50 kilogram

For service contractors:

- ◆ Make sure your technicians are properly trained and well aware of intentional venting of CFC refrigerant is an offence under the law;
- ◆ Use approved equipment to recover and recycle refrigerants containing CFCs; and
- ◆ Provide equipment owner with service records for equipment with a refrigerant charge greater than 50 kilogram.