Department for Environment, Food and Rural Affairs

# Guidance for Stationary Refrigeration & Air-Conditioning

## The EU Ozone Regulation: Legislative update and strategies for HCFC Phase-out

## Information Sheet RAC 8: R22 Phase-out

### April 2012



### Contents

# 1 Background to HCFC Phase-Out

The EU Ozone Regulation has been recast and the new Regulation (EC/1005/2009) provides the legislative framework for EU Member States to meet their obligations under the Montreal Protocol, the international agreement drawn up to halt damage to the ozone layer.

The most harmful ozone-depleting substances (e.g. CFCs like R12) were banned in the 1990s. New equipment using less harmful "transitional" HCFC refrigerants like R22 was banned in 2001 (or 2004 for small air-conditioning systems). From the end of 2009 the use of virgin HCFCs to service and maintain existing refrigeration and air-conditioning (RAC) equipment is banned in all EU Member States. See Information Sheet RAC 3 for details of the current legal obligations. The two key phase-out dates are:

- **Since 1st January 2010** it has been illegal to use virgin HCFCs to service RAC equipment. Only reclaimed and recycled HCFCs may be used. Supplies of recycled or reclaimed HCFCs might be very limited and very expensive. Note, this ban applies even if HCFC refrigerant was purchased before the ban date. It is illegal to use stockpiles of virgin HCFCs after the end of 2009, any stockpiled HCFCs should be returned to fluid suppliers for appropriate disposal.

- **From 1st January 2015** it will be illegal to use any HCFCs to service RAC equipment – so recycled or reclaimed HCFC may no longer be used. See Section 5 below for more details.

The ban on the use of virgin HCFC gases represents a very real business threat to any company which uses refrigerants like R22 or R408A in their processes or air conditioning systems. R22 remains one of the most commonly used refrigerants in the UK so many organisations are going to be affected by the ban. Sectors at greatest risk include the food and drink industry, petro-chemicals, pharmaceuticals, health, retail, hospitality, finance and data-processing. Typical applications can vary widely, but examples include refrigeration systems in supermarkets, blast chillers, cold stores and process coolers and many types of building air-conditioning as well as in transport refrigeration. Many of these applications are absolutely critical to the continued operation of their owner's business.

It should be noted that the bans described above refer to the "use" of HCFCs. In terms of considering what action needs to be taken it should be noted that 'use' in relation to equipment containing HCFCs means -

*"the utilisation of controlled substances in the production or maintenance, in particular refilling, of products or equipment"*

This means that it is permissible to carry on using equipment that contains HCFCs beyond the phase-out dates, but there must be no maintenance or servicing undertaken on the equipment that involves breaking into the refrigerant circuits.

Given that most RAC systems leak to a certain degree, in practical terms this implies that any equipment that is of strategic importance to a business should not be using HCFCs by 2015 so all current users of HCFC systems must develop a plan to manage their operations without HCFCs. Doing nothing is not a sustainable option. Given the serious implications and potential costs, businesses should follow a strategic approach. This is introduced in Section 2.

The recast Regulation came into force on 1st January 2010 and changes the rules for continuing use of HCFCs in RAC systems. See Section 6 for more details.

## 2 HCFC Phase-Out Strategy

The six point plan below provides a model for a successful phase-out strategy:

**Assess the Risk** – identify all systems containing HCFCs and estimate their associated business risk.

**Prioritise** – identify the most business-critical systems and address these first. But do not neglect all the other systems, these must also be managed.

**Determine the Phase-out Solution** – on a plant-by-plant basis, identify the most appropriate phase-out solution. These are likely to fall within one of three main options: Replace, Convert or Leave As-Is. These are described in more detail in Section 3. Each plant must be assessed against a number of decision criteria to identify the optimum solution. These include system type, age, condition, availability and energy efficiency (see Section 4 for details).

**Planning and Budgeting** – develop a Phase-out Plan, with phased implementation of the Phase-out Solutions. Depending on the size of your operation, it is unlikely to be possible or desirable to carry out all the actions at once. This will need to be done in association with your refrigeration contractor in order to ensure their commitment.

**Implementation** – carry out the plan, with monitoring and regular review.

**Managed Use of Recycled and Reclaimed HCFCs** – many HCFC systems still in operation will continue to operate during the virgin ban and even after the complete HCFC ban comes into place. Users of these systems should manage their own stocks of recycled HCFC gas or secure a supply of reclaimed HCFC gas (see Section 4). When systems are either replaced or converted, the recovered gas should be recycled. Recycled HCFC refrigerant can then only be used, by either the undertaking which carried out the recovery (in most cases the refrigeration contractor) or the undertaking for which the recovery was carried out (the owner), in other systems still using HCFCs (until the end of 2014). The obligations on those handling HCFCs and those operating systems containing HCFC have changed and are now similar to those in the EU F gas Regulation (regular leak testing, prompt repair by qualified personnel and record-keeping). See Section 6.

# 3 Phase-out Solutions

After identifying all systems using HCFC refrigerants, each one should be assessed against decision criteria and assigned one of three main Phase-out Solutions. These are:

## 3.1 Replace

Some old systems, including those that are in poor condition, inefficient or not meeting their current (or forecast) cooling load, should be replaced with new systems using a non-ODS refrigerant. These can include HFCs (but these must comply with the EU F gas Regulations) or a "natural" refrigerant like hydrocarbons, ammonia or carbon dioxide.

This option can have a number of benefits, most importantly the opportunity to significantly improve energy efficiency. It may also be possible to reduce the charge of refrigerant, either by using new "critical charge" systems or by employing secondary coolants. Replacement is however likely to be the most expensive option in up-front cost terms (around 10 times more than a conversion).

## 3.2 Convert

For many types of RAC system, which are in good order, it will be possible to recommend a Convert Solution.

This covers a range of actions, from a relatively simple "retrofill" operation (using one of the "service" or "drop-in" HFC refrigerants that are compatible with the system's existing mineral oil) to a more comprehensive modification to a standard HFC refrigerant (which will require a new type of oil at least, and may require additional compressor and/or heat exchanger capacity).

There are a number of "drop-in" gases offered by the main refrigerant suppliers (including HFCs 417A, 422A, 422D, 424A, 427A, 428A and 434A). They are however all mixtures, with component gases which boil at slightly different temperatures and pressures – a phenomenon known as "glide". This is common with many of the other HFC refrigerants (which are widely used in direct expansion systems) and the industry has become familiar with this property. There is not, however, a recognised "retrofill" solution for flooded or pump-circulation systems. If you have a flooded HCFC system, then you should approach your refrigeration contractor or an independent consultant as soon as possible.

Whilst a conversion is often a practical option it must be noted that a converted plant may have less cooling capacity and / or be less efficient than the original system. Also, the conversion must be carried out by expert contractors to ensure that refrigerant leakage does not get worse after the conversion.

### 3.3 Leave As-Is

This is not a “do nothing” option. It is only applicable if:

a) a guaranteed stock of recycled or reclaimed HCFC is assured; or

b) the system represents no business-critical risk.

Case (a) may be appropriate if it is not practical to either Replace or Convert the system. This may be true if, say for a large petro-chemical plant, shut-downs only occur every 2 years and the refrigeration system must be kept running in the meantime. This is however a risky option, since leaks are unpredictable both in frequency and scale.

Case (b) may be appropriate for example to a small non-critical split air-conditioning system in an office. This type of system is typically very reliable and may continue to operate without trouble for many years. It could be replaced relatively quickly and cheaply with a new system using a non-ODS refrigerant.

## 4 Decision Criteria

The decision to either Replace, Convert or Leave an HCFC plant should be based on a number of criteria. There is no automatic decision algorithm and a balanced assessment must be made of each criterion for each plant. These criteria will include:

**System Type** – does the system use “direct expansion” or a “flooded” evaporator? Direct expansion (or DX) systems may be suitable for conversion to an HFC replacement gas, but flooded systems need further consideration. This is an important distinction and requires an assessment by an experienced refrigeration or air conditioning engineer.

**Age** – refrigeration and air conditioning plant over 20 years old are likely to be approaching the end of their natural life and should probably be replaced. Systems under 10 years should probably be retrofilled. The bulk of HCFC systems will be between 10 to 20 years old and these should be assessed further. As a further guide, if a system has previously been converted from R12 or R502 to R22, then this should also be replaced and not converted a second time.

**Condition** – if a system has been well maintained and is in good condition, this would tend to be more suitable for a Convert solution. Records of refrigerant leakage are important indicators to the likely success of a “retrofill” operation.

**Meeting Current Requirements** – due to the rapid rate of change in many industries, many refrigeration systems are no longer operating within their original design specification. This is likely to impinge on operating performance, reliability and energy efficiency. The HCFC phase-out presents an opportunity to Replace the system (or alter it) to meet the current and forecast application requirements.

**Energy Efficiency** – capital costs of commercial and industrial refrigeration and air-conditioning systems are typically around 20% of the total lifetime costs. The benefits of

replacing an old system with a new energy-efficient system should be assessed. New options such as free-cooling can be specified to provide significant on-going savings.

**Availability** – system-specific characteristics must be considered to identify the correct option. Some systems are so “embedded” within the factory or building that replacement may be almost impossible. Alternatively, it may be possible to build a replacement plant alongside the existing HCFC plant and then switch-over with the minimum or disruption.

# 5 Availability and Permitted Use of Recycled and Reclaimed HCFCs

Only *recycled* or *reclaimed* HCFCs may be used to service and maintain RAC systems from 1st January 2010 until end of December 2014. Any virgin HCFCs that have been stockpiled cannot be used to service and maintain RAC systems and should be returned to fluid suppliers for appropriate disposal.

The recast EU Ozone Regulation (EC/1005/2009) includes an important distinction between *“recovered”*, *“recycled”* and *“reclaimed”* refrigerant gases.

***Recovered HCFC*** – is refrigerant that has been collected from equipment and stored during maintenance or servicing or before disposal. Recovered HCFC can be reused in the equipment it has been collected from, but needs to be *recycled* or *reclaimed* to be reused in other equipment.

***Recycled HCFC*** – is recovered HCFC gas that has been subject only to a basic cleaning process (this might include mechanical filtering and moisture removal). *Recycled* HCFCs may only be used by either the undertaking which carried out the recovery (in most cases the refrigeration contractor) or the undertaking for which the recovery was carried out (the owner). *Recycled* HCFCs may not be placed on the market – "placing on the market" means the supplying or making available to third persons within the Community for payment or free of charge. For example, the owner could use the recycled HCFC in RAC equipment at other sites they operate from, but they cannot sell or give *recycled* HCFC to a third party.

***Reclaimed HCFC*** – is recovered HCFC gas that has been chemically reprocessed to a specified standard. *Reclaimed* HCFCs may be placed on the wider market and used by undertakings other than the original contractor and owner. *Reclaimed* HCFCs must be held in containers labelled as such, with information on the batch number and name and address of the reclamation facility.

The availability and price of *reclaimed* HCFC gases are very uncertain.

It is worth noting that use of *recycled* HCFCs is more risky than use of *reclaimed* HCFCs. This is because *reclaimed* material has been reprocessed to a specified quality that is suitable for use in a refrigeration system whereas *recycled* material is of an unknown quality – it might contain contaminants that could impair the performance of a refrigeration

plant. As a general rule it is worth spending a bit more to get recovered refrigerant properly reprocessed into *reclaimed* fluid.

Currently there are only a small number of companies in the UK with reclamation facilities. They can offer a range of solutions to their clients, including the "banking" of *reclaimed* R22 in their own storage facilities.

Those recovering HCFCs for *recycling* or *reclamation* should also consider the following points if intending to store the materials on site:

- The holder should ensure that cylinders used to store *recovered/recycled* HCFCs remain within their statutory pressure test validation period.
- Recovered HCFCs pending *recycling* or *reclamation* are hazardous waste. Therefore recovered HCFCs should be handled as hazardous waste as required under the Hazardous Waste Regulations[1]. Facilities storing recovered HCFCs must register with the Environment Agency as an exempt waste operation. This would allow storage of up to 18 tonnes for a maximum period of 6 months. Storage of *recycled* or *reclaimed* HCFCs does not require a permit. Any storage of recovered HCFCs, other than immediately prior to *recycling* or transfer for *reclamation*, requires an exemption.

If *recycled* or *reclaimed* HCFCs are used in RAC equipment the following labelling and record keeping requirements apply. These obligations apply to both **stationary** and **mobile** equipment.

**Labelling** - when recycled or reclaimed HCFCs are added to RAC equipment it should then be labelled. A label should show:

- The type of refrigerant and the total quantity contained in the system, and
- The label elements set out in Annex I to Regulation EC/1272/2008 for substances or mixtures classified as Hazardous to the Ozone Layer.

An example of a label is shown below:

**This equipment contains RECYCLED/RECLAIMED refrigerant**

**Type of Refrigerant…..……..**

**Total Refrigerant Charge (kg)……**

**DANGER**

**EUH059: HAZARDOUS TO THE OZONE LAYER**

**AVOID RELEASE TO THE ENVIRONMENT**

**DISPOSE OF THIS REFRIGERANT AS HAZARDOUS WASTE**



[1] In Scotland the Special Waste Regulations apply, contact SEPA for more details

**Record keeping** - if using *recycled* or *reclaimed* HCFCs the following record keeping requirements apply:

- Undertakings using *recycled* or *reclaimed* HCFCs for service or maintenance must keep records of the undertakings that supplied the *reclaimed* gases and the sources of *recycled* gases.

- Users of equipment containing over 3 kg of HCFC refrigerant shall keep a record of the quantity and type of any gases removed or added, and of the company or technician carrying out the servicing or maintenance.

# 6 Other Amendments to the EU Ozone Regulation

In addition to the points described in Section 5 above, the new ozone legislation includes further obligations on the operators of HCFC systems. These are broadly similar to the requirements of the EU F gas Regulation and include the following points:

1. Undertakings shall take all precautionary measures practicable to prevent and minimise any leakages and emissions of controlled substances.

2. Leak Testing – undertakings operating stationary RAC systems with an HCFC charge of:

    - 3 kg or more are checked for leakage at least once every 12 months; this shall not apply to equipment with hermetically sealed systems, which are labelled as such and contain less than 6 kg of HCFC;

    - 30 kg or more are checked for leakage at least once every six months;

    - 300 kg or more are checked for leakage at least once every three months;

    and that any detected leakage is repaired as soon as possible and in any event within 14 days.

    The equipment or system shall be checked for leakage within one month after a leak has been repaired to ensure that the repair has been effective.

3. Undertakings operating stationary RAC systems with an HCFC charge of 3 kg or more shall maintain records on the quantity and type of HCFC added and recovered during servicing, maintenance and final disposal of the equipment. They shall also maintain records of other relevant information including the identification of the company or technician who performed the servicing or maintenance, as well as the dates and results of the leakage checks carried out. These records shall be made available on request to the competent authority and to the Commission. Please see our sample record at the end of this information sheet.

4. The EU Ozone Regulation leaves it for Member States to define the minimum qualification requirements for the personnel carrying out activities referred to in point 1. Currently the following qualifications are valid to work on equipment containing HCFCs in Great Britain:

    - City and Guilds 2078 or
    - City and Guilds 2079 – a Category I or II qualification
    - Construction Skills J01
    - Construction Skills J11
    - Construction Skills J12

## Example record keeping sheet

Below is an example record keeping sheet for systems containing 3 kg or more of HCFC refrigerant. This example includes some non-mandatory fields, such as total refrigerant charge in the system. This also includes field to collect information required when using recycled and reclaimed HCFCs.

| **Equipment Record** | | | | | |
|---|---|---|---|---|---|
| Name of Equipment Operator | | | | | |
| Postal Address | | | | | |
| Telephone Number | | | | | |
| Equipment Model | | Reference Number | | | |
| Description | | Hermetically Sealed | | Yes / No | |
| Location of plant | | Date of Installation | | | |
| Refrigerant Type | | Refrigerant Quantity (kg) | | | |
| **Refrigerant Additions** | | | | | |
| Date | Personnel/Company* | Type of Refrigerant | Amount Added, kg | Reclaimed/ Recycled | Source or recycled/ Reclaimed supplier |
| | | | | | |
| | | | | | |
| **Refrigerant Removals** | | | | | |
| Date | Personnel/Company* | Type of Refrigerant | Amount Removed, kg | Reason for removal Reuse/ Proper disposal of refrigerant | |
| | | | | | |
| | | | | | |
| **Leak Tests (including follow-up tests)** | | | | | |
| Date | Personnel/Company* | Areas Checked | Test Result (location and cause of any leaks identified) | Follow up actions & checks required | |
| | | | | | |
| | | | | | |
| **Maintenance or Servicing Activities** | | | | | |
| Date | Personnel /Company* | Areas concerned | Maintenance/ servicing work | Comments | |
| | | | | | |
| | | | | | |
| **Equipment Disposal** | | | | | |
| Date | Personnel /Company* | Disposal route | Maintenance/ servicing work Comments | | |
| | | | | | |
| **Other relevant information** | | | | | |
| | | | | | |