Revised Guidance Note for Ozone Depleting Substances
Ozone Depleting Solvents

August 2008
Acknowledgements

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Appendix A - Examples of Permitted Laboratory Use

Appendix B - ODS Waste management Guidance
WHAT YOU NEED TO KNOW

This Guidance Note is intended for those involved in the use of Ozone Depleting Substances (ODS) as solvents. Information gathered to date has indicated that such uses are no longer common in Ireland. Regulation (EC) No. 2037/2000 on substances that deplete the ozone layer is further implemented in Ireland by the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006) and the main provisions are outlined in below.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Guidance Note Section No.</th>
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<tr>
<td>ODS compounds historically used as solvents (e.g. CFCs, HCFCs, 1,1,1-tricloroethane, carbon tetrachloride, bromochloromethane) can no longer be employed for this use</td>
<td>4.2/4.4</td>
</tr>
<tr>
<td>Use of these compounds may still be allowed for use as a processing agent, while use of ODS as a feedstock is also allowed (see main report for definition of ‘feedstock’ and ‘processing agent’)</td>
<td>4.4</td>
</tr>
<tr>
<td>Limited use of these compounds may still be allowed in certain essential laboratory use</td>
<td>4.4</td>
</tr>
<tr>
<td>Use of HCFCs in precision cleaning of electrical and other components in aerospace and aeronautics applications is still allowed until 31 December 2008</td>
<td>4.2/4.4</td>
</tr>
<tr>
<td>Trade in these compounds (or products or equipment containing ODS) with countries outside of the European Community is effectively prohibited, with limited exceptions, for which authorisation from the Commission is required</td>
<td>4.3</td>
</tr>
<tr>
<td>There are no specific training requirements in relation to personnel handling ODS solvents, though best practice measures should be applied at all times</td>
<td>4.5</td>
</tr>
<tr>
<td>A range of suitable alternatives are available and recommended by the European Commission</td>
<td>7.0</td>
</tr>
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<td>Disposal and destruction should be carried out in line with the requirements of Irish and European waste legislation</td>
<td>5.0</td>
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1. INTRODUCTION

The stratospheric ozone layer acts as a protective barrier or ‘natural sunscreen’ in the upper atmosphere, preventing harmful ultraviolet radiation from reaching the earth’s surface. Research during the 1970’s and 1980’s identified a hole in this ozone layer at certain times of the year above the Antarctic, with CFCs (chlorofluorocarbons) being identified as the cause of the depletion of stratospheric ozone. In addition to CFCs a range of other Ozone Depleting Substances (ODS) were identified as contributing to the depletion of the ozone layer. Through the United Nations Environment Programme (UNEP) a Global Convention was developed to protect the ozone layer, eventually resulting in the development of the Montreal Protocol in the late 1980’s. Regulation (EC) No. 2037/2000 on substances that deplete the ozone layer is the European response under the Montreal Protocol. The Protocol is under constant review and amendments are agreed under the auspices of the United Nations (UN). Ireland has ratified all amendments.

Regulation (EC) No. 2037/2000\(^1\) established rules for the production, import, export, placing on the market, use, recovery, recycling, reclamation and destruction of substances, referred to as controlled substances, that deplete the ozone layer. This covers a range of substances including:

The ozone depleting substances covered by the Regulation include:

- Chlorofluorocarbons (CFCs);
- Hydrochlorofluorocarbons (HCFCs);
- Halons;
- 1,1,1 trichloroethane;
- Carbon tetrachloride;
- Bromochloromethane;
- Hydrobromofluorocarbons (HBFCs);
- Methyl bromide.

These substances are mostly used in refrigeration, air-conditioning (including heat pump equipment), fire suppression and pest control. Furthermore, some ODS (e.g. 1,1,1-trichloroethane, carbon tetrachloride, HCFCs, CFCs, bromochloromethane) are used as solvents, aerosol sprays and blowing agents. The Regulation prohibits the use of CFCs, halons, 1,1,1 trichloroethane, carbon tetrachloride, bromochloromethane, HBFCs and methyl bromide (with some

\(^1\) A copy of the Regulation and other relevant information can be downloaded from the Commission’s website at: [http://ec.europa.eu/environment/ozone/index.htm](http://ec.europa.eu/environment/ozone/index.htm)
exceptions). In addition, gradual phase-out and a medium term prohibition on HCFCs is introduced.

Many types of ODS have been used as solvents, including, most commonly, CFC-113, 1,1,1-trichloroethane, carbon tetrachloride, bromochloromethane and HCFCs. In this context the term “solvent” is used for convenience, as a collective term for a wide variety of applications, as solvents in its literal meaning, for other cleaning applications, for de-greasing, as carriers for lubricants, for drying and etching, as adhesives, for coating, as process agents, etc.

The use of these compounds as solvents is controlled (including use of stockpiled materials) under the requirements of Regulation (EC) No. 2037/2000. There are a number of exceptions where they can continue to be used as follows:

- as a processing agent;
- as feedstock; and,
- in the case of HCFCs only, in laboratory uses, including research and development
- in essential uses, including some laboratory uses

Definitions of feedstock and processing agent are provided as follows (as per Article 2 of Regulation 2037/2000):

- “feedstock” means any controlled substances or new substance that undergoes chemical transformation in a process in which it is entirely converted from its original composition and whose emissions are insignificant.
- “processing agent” means controlled substances used as chemical processing agent in those applications listed in Annex VI, in installations existing at 1 September1997, and where emissions are insignificant.

A temporary exemption (until 31 December 2008) also exists for the use of HCFCs in the precision cleaning of electrical and other components in aerospace and aeronautics applications. Nonetheless, summary information on these compounds are presented in this Guidance Note.

2. HISTORICAL AND PRESENT USE OF ODS SOLVENTS

In the past, CFC-113 use was essential in many industrial applications: in electronic assembly production processes, precision cleaning and general metal degreasing during manufacture, as well as in dry cleaning and other industrial applications. CFC-113 began to be used in the 1970s in metal degreasing and other areas owing to concern, particularly in the United States and Japan, favoured over the toxicity of the chlorinated solvents used previously (UNEP, 2001).

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A number of HCFC compounds have been used as solvents, the most common of which is **HCFC-141b** (dichlorofluoroethane). Other HCFCs used as solvents include **HCFC 225ca** and **HCFC 225cb** (two different isomers of dichloropentafluoropropane). These compounds have been employed in many cases as a substitute for the more traditional solvents such as 1,1,1-trichloroethane.

**1,1,1 Trichloroethane** (also known as Methyl Chloroform) had been widely used as a versatile all-purpose solvent. It was introduced in the mid-1950’s as a cold cleaning solvent substitute for carbon tetrachloride.

**Carbon tetrachloride** is a highly toxic compound, which was formerly used for metal degreasing and as a dry-cleaning fluid, fabric-spotting fluid, fire-extinguisher fluid, grain fumigant and reaction medium, in addition to other historical uses.

**Bromochloromethane** (also known as Chlorobromomethane) had its primary use as a feedstock in the manufacture of biocides within enclosed systems. Around 150-225 tonnes per annum was reported to be used for this purpose in the UK. It has also been historically used in fire extinguishers, and other applications including degreasing, organic synthesis and as a reaction solvent.

General information on the compounds detailed above is presented in Table 1. Some of these compounds may still be in use in laboratories. Essential laboratory uses are permitted under the Regulation 2037/2000, subject to certain restrictions. These are discussed further in Section 4.4.
Table 1  General information on ODS solvents

<table>
<thead>
<tr>
<th>Common Name</th>
<th>1,1,1-Trichloroethane</th>
<th>Carbon Tetrachloride</th>
<th>CFC-113</th>
<th>HCFC 141b</th>
<th>HCFC 225ca</th>
<th>HCFC 225cb</th>
<th>Bromochloromethane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Formula</td>
<td>$C_2H_3Cl_3$</td>
<td>$CCl_4$</td>
<td>$C_2F_3Cl_3$</td>
<td>$C_2H_3FCl_2$</td>
<td>$C_3HF_5Cl_2$</td>
<td>$C_3HF_5Cl_2$</td>
<td>$CH_2BrCl$</td>
</tr>
<tr>
<td>Synonyms</td>
<td>Methyl Chloroform</td>
<td>Carbon Tetrachloride</td>
<td>1,1,2-Trichlorotrifluorothane</td>
<td>Dichlorofluoroethane</td>
<td>Dichloropentafluoropropane</td>
<td>Dichloropentafluoropropane</td>
<td>Bromochloromethane Chlorobromo-methane Methylene-chlorobromide</td>
</tr>
<tr>
<td>CAS Number</td>
<td>71-55-6</td>
<td>56-23-5</td>
<td>76-13-1</td>
<td>1717-00-6</td>
<td>422-56-0</td>
<td>507-55-1</td>
<td>74-97-5</td>
</tr>
<tr>
<td>UN Number</td>
<td>UN 2831</td>
<td>UN 1846</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>UN 1887</td>
</tr>
<tr>
<td>UN Hazard Class</td>
<td>6.1</td>
<td>6.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.1</td>
</tr>
<tr>
<td>CN Code (CN 99)</td>
<td>2903 1910</td>
<td>2903 1400</td>
<td>2903 4300</td>
<td>2903 4900</td>
<td>2903 4900</td>
<td>2903 4900</td>
<td>2903 4980</td>
</tr>
<tr>
<td>ODP$^3$</td>
<td>0.1</td>
<td>1.1</td>
<td>0.8</td>
<td>0.11</td>
<td>0.025</td>
<td>0.033</td>
<td>0.12</td>
</tr>
<tr>
<td>Atmospheric Lifetime (Years)</td>
<td>5.0</td>
<td>26</td>
<td>85</td>
<td>9.3</td>
<td>1.9</td>
<td>5.8</td>
<td>0.37</td>
</tr>
</tbody>
</table>

$^3$ Each ozone depleting substance is assigned an ODP relative to the compound CFC-11, which has an ODP of 1.
3. ENVIRONMENTAL IMPACT

The solvents discussed in this Guidance Note are referred to as ozone depleting substances (ODS), because once these gases are released into the environment and reach the stratosphere, they interact with the ozone and destroy ozone molecules. ODS lifetime in the stratosphere can be between 100 and 400 years. Atmospheric lifetimes are presented in Table 1 for ODS solvents, indicating lifetimes of between 0.37 and 85 years. An ODS molecule has potential to destroy ozone molecules during its entire lifetime. Therefore, various controlled substances are assigned Ozone Depletion Potentials (ODP) depending on their potential to cause ozone depletion in the stratosphere (Table 1).

Ozone is a gas composed of three bonded oxygen atoms (O₃). In the Earth’s atmosphere, ozone is formed from molecular oxygen (O₂) in the reactions initiated by the UV light. Ozone can be found in two levels, at ground level and in the Earth’s upper atmosphere referred to as the stratosphere. At ground level, ozone is a significant air pollutant, forming smog. In the stratosphere it is referred to as the ozone layer. The ozone layer encircles the stratosphere at approximately 10 km above ground level. It filters ultraviolet (UV) radiation reducing the amount of radiation reaching ground level. The depletion of the ozone layer exposes living organisms to high levels of the harmful UV-B radiation. Most importantly, this negatively impacts human health causing increased occurrence of skin cancers, cataracts and weakened immune system. Other negative impacts of depletion of the ozone layer are:

- High levels of UV-B radiation causes sunburn and can potentially damage DNA,
- Changes in plant growth,
- Degradation of building materials, particularly paints, rubbers, woods and plastics.

The most significant ozone layer depletion occurs over Antarctica, where the ozone concentration is approximately 30% of its pre-1970s concentration. Ozone concentration is still decreasing, but at a lower rate since implementation of the Montreal Protocol in 1989. It is estimated that the ozone layer above Antarctica will recover after 2050.

While many ozone depleting substances also have potential health and safety impacts (see Risk and Safety phrases in Table 1) the objective of the Regulation and of this Guidance Note relates to the potential for depletion of the ozone layer due to release of these compounds.

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4 Each ozone depleting substance is assigned an ODP relative to the compound CFC-11, which has an ODP of 1.
Further information on ozone depletion and international action is available from the United Nations Environment Programme website (http://ozone.unep.org/index.shtml).

4. IMPACT OF THE REGULATIONS

4.1. Implementation

Under the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006), the Environmental Protection Agency is the designated competent authority for implementation and enforcement of Regulation 2037/2000. Three competent bodies have also been assigned official responsibility under the Regulations: Department of Agriculture and Food, the Revenue Commissioners (Customs Division) and the Maritime Safety Directorate.

Specific requirements, such as minimum qualifications, have also been introduced in Ireland under the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006). This is discussed further in Section 4.5.

4.2. Phase-Out Dates

The only ongoing solvent use that is permitted is the use of HCFCs in precision cleaning of electrical and other components in aerospace and aeronautics applications, where the prohibition shall enter into force on 31 December 2008.

The use of HCFCs as feedstock, as a processing agent and in essential laboratory use is allowed. This is described in further detail in Section 4.4.

4.3. Import and Export

Import and export in the context of Regulation (EC) No. 2037/2000 refers only to trade with non-EU countries and does not refer to movement of ODS within the European Community. The import and export of ODS is subject to strict limitations as detailed in the Import and Export Declaration documents which can be downloaded from the Commission ODS website at: http://ec.europa.eu/environment/ozone/ods.htm.

Import and export in the context of Regulation (EC) No. 2037/2000 refers only to trade with non-EU countries and does not refer to movement of ODS within the European Community. The shipment of waste ODS within the EU is governed by other national and EU legislation. Figure 1 illustrates the relationships in the ODS import and export reporting requirements etc. The import and export of ODS is subject to strict limitations as detailed in the Import and Export Declaration documents which can be downloaded from the Commission ODS website at: http://europa.eu.int/comm/environment/ozone/ods.htm.

The import and export of the majority of ODS is effectively prohibited, with limited exceptions for authorised essential uses, use as a feedstock or processing agent, and import for destruction (this not applicable for Ireland as no destruction
facilities are available in Ireland). The import and export of equipment and products containing ODS is also severely restricted. Imports are allowed for authorised essential uses. Products and equipment shown to be manufactured prior to the entry into force of the Regulation (i.e. before 1 October 2000) are not subject to import prohibitions.

Further limitations are applicable to trade with countries which are not party to the Montreal Protocol, with trade only being allowed under very limited circumstances.

The import and export of methyl bromide into/out of the European Community requires authorisation from the Commission under Regulation (EC) No. 2037/2000. Import Licenses and Export Authorisation Numbers can be obtained via the Commission’s ODS website by following the correct procedures. This includes making an advance declaration of intention to import or export ODS, the year before the intended import or export is to take place. It is the responsibility of the importer/exporter to apply to the Commission via their website http://europa.eu.int/comm/environment/ozone/ods.htm. All correspondence with the Commission should be directed to:

Ozone Layer Protection  
European Commission  
Directorate - General Environment  
Unit ENV.C.2 – Climate Change  
B 1049 Brussels  
Fax: + 32 22 99 8764  
Email: env-ods@ec.europa.eu

If an import request is approved, the Commission will allocate a portion of the available methyl bromide quota to the applicant for import and issue an import licence. A copy of the import licence will be sent to the Competent Authority of the Member State. Similarly, for authorised exports from the EU, the exporter is issued with an Export Authorisation Number (EAN). Exports cannot be carried out without an EAN issued by the Commission. Applications for import and export authorisation must be renewed on an annual basis. Importers and exporters are required to report annually to the Commission according to Article 19 of Regulations 2037/2000, with specified data on import and export of methyl bromide. A copy of the report must be submitted to the Environmental Protection Agency:

Ozone Depleting Substances  
Office of Licensing and Guidance  
Environmental Protection Agency  
P.O. Box 300  
Johnstown Castle Estate  
Co. Wexford

Or via e-mail to ods@epa.ie
In addition, stamped used licence documents (import licences and export authorisation numbers) must be provided to Customs (www.revenue.ie) at the point of import or export. Further guidance on import and export procedures can also be obtained from Customs.

It is recommended that any person wishing to carry on trade of ODS or ODS containing equipment with countries outside the European Community should carefully consult the Regulation 2037/2000 and S.I. No. 281 of 2006 and the guidance provided on the Commission ODS website prior to making an application to the Commission.

It should also be noted that the Regulation 2037/2000 prohibits the transportation of all ODS in disposable containers, except for essential uses.
Figure 1  Guidance for importers and exporters
4.4. Supply and Use

The general prohibitions on the use and supply of controlled substances does not apply to use as feedstock or processing agents, as discussed in Section 1. The Regulation allows HCFCs to be used as solvents in the precision cleaning of electrical and other components in aerospace and aeronautics applications up to 31 December 2008. In addition, controlled substances can be used as feedstock or processing agents and in limited (essential) laboratory applications, including research and development.

There are no specific restrictions on use of ODS as a feedstock, though users for this purpose (and also for processing agent and essential laboratory use) should be aware of the import requirements for ODS (see Section 4.3) should they need to source ODS from outside the European Community. Annex VI of the Regulation specifies a limited number of purposes for which use as a processing agent is permitted, and includes only use of carbon tetrachloride, CFC-11, CFC-113, CFC-12 and HCFCs. Please consult Annex VI of the Regulation for specific information on the permitted processes.

Essential Laboratory Use

End user laboratories (e.g. companies, research centres, and universities), and distributors of ODS for essential laboratory and analytical uses, availing of ODS essential uses must be registered in the Laboratory ODS Database. After the registration process is finished an ID-number is issued that proves that the undertaking is registered and licensed to use ODS for laboratory purposes. ODS may only be sold to undertakings that present the ID-number.

Producers and importers of ODS for essential laboratory and analytical uses need to follow strict procedures for declaration and authorisation via the Commission’s ODS database. Further information is available on the Commission’s ODS webpage: [http://ec.europa.eu/environment/ozone/uses.htm](http://ec.europa.eu/environment/ozone/uses.htm). However, there are no such producers or importers in Ireland as supplies to Irish end-users are from within the EC.

It should be noted that not all laboratory uses are allowed, for example ODS use for oil in water analysis is forbidden. Examples of permitted laboratory uses are included in Appendix A to this Guidance Note. Laboratory uses for ODS may include the following:

- equipment calibration,
- use as extraction solvents,
- diluents or carriers for chemical analysis,
- biochemical research,
- inert solvents for chemical reactions,
- as a carrier or laboratory chemical, and
- other critical analytical and laboratory purposes.
All users of ODS must actively investigate the availability of technically and economically feasible non-ODS alternatives to the ODS currently in use.

 Suppliers of the compounds discussed in this Guidance Note should be aware of the limited uses for which these compounds are now allowed, and should not supply ODS for uses not allowed under the Regulation and/or to users not authorised for essential uses by the Commission. In relation to laboratory use suppliers should not provide ODS to users who have not been provided with a user ID number by the Commission.

4.5. Training

Minimum qualification requirements for those involved in handling controlled substances have been defined in the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006), addressing Article 16 of Regulation 2037/2000. These minimum qualification requirements have been defined for the fumigation, fire protection and refrigeration, air conditioning and heat pump sectors. As the use of ODS solvents is limited in Ireland, it is not considered viable to develop a minimum qualification standard in this sector. At present the only authorised use of ODS solvents is for use of HCFC in the aerospace industry (and for use as a feedstock, essential laboratory use or processing agent).

However, best practice measures should be followed in relation to handling and disposal of all solvents. Virtually all solvents are regulated under the Solvent Emission Directive (translated into Irish legislation as the Emission of Volatile Organic Compounds from Organic Solvents Regulation 2002, SI No. 543) and solvent users should refer to the Regulation to identify the applicable consumption threshold for various activities. The UK Health and Safety Executive has published an information sheet regarding the ‘Safe Use of Solvent Degreasing Plant’ (Engineer Information Sheet No. 40), which can be downloaded from the following location: http://www.hse.gov.uk/pubns/eis40.pdf

Enterprise Ireland has also produced a Best Practice Guide for ‘Good Housekeeping Measures for Solvents’ which covers:

- Development of training and procedures for solvent handling;
- Delivery, storage, distribution and processing;
- Avoiding spills;
- Use minimisation;
- Recovery and re-use;
- Disposal;
- Maintenance;
- Solvent auditing.
This guide can be downloaded from the Enterprise Ireland Envirocentre website (http://www.envirocentre.ie/)

Those using ozone depleting substances for essential laboratory use should also refer to the above guidance.

There are potential health risks associated with exposure to these ODS solvents and they carry a number of Risk Phrases. These risk phrases define health and safety risk assigned to any compound, and are defined in Annex II of Directive 67/548/EEC (and amendments) which relates to the classification, packaging and labelling of dangerous substances. The use of such dangerous substances in the workplace is covered under Irish legislation by the Chemical Agents Regulations, 2001⁵. These Regulations require that a risk assessment be conducted when using such substances and that controls be put in place if required to protect the user and also members of the public. The Health and Safety Authority is the Competent Authority for workplace safety and it has issued guidance documents in relation to safe use of chemicals. Documents can be downloaded from www.hsa.ie.

5. ODS WASTE MANAGEMENT

Detailed guidance on management of waste ODS is provided in Appendix B, while a general introduction is provided in this section.

Waste ODS (and also, potentially, used ODS containers) would be considered a hazardous material and would be subject to the requirements of the relevant EU and Irish waste management legislation including:

- Waste Management Acts 1996 to 2008;
- Waste Management (Hazardous Waste) Regulations 1998;
- Waste Management (Movement of Hazardous Waste) Regulations, 1998;
- Waste Management (Shipment of Waste) Regulations, 2007;
- The Carriage of Dangerous Goods by Road Regulations, 2001;
- Waste Management (Collection permit) Regulations, 2007;
- Waste Management (Collection Permit) (Amendment) Regulations, 2008

It is important to note that the legislative references detailed in the text are subject to ongoing review both at EU and national level and may change in time.

For movement of hazardous waste within Ireland, the movement of the waste must be recorded by means of a consignment note, known as a C1 form (which are obtained from local authorities).

Export of hazardous waste is subject to Transfrontier Shipment (TFS) requirements. Dublin City Council operates the National TFS Office, which can be contacted as follows:

Dublin City Council National TFS Office
Eblana House
68-71 Marrowbone Lane
Dublin 8
Administration Department
(01) 222 4411
(01) 222 4634
(01) 222 4249
Technical Department
(01) 222 4374
(01) 222 4235
(01) 222 4467
Fax: (01) 411 3440
Email: nationaltfs@dublincity.ie
Web: www.dublincity.ie

The movement and disposal of hazardous waste is a relatively complex and specialised area, and it is therefore recommended that the services of a licensed hazardous waste contractor is employed to dispose of any consignments of hazardous waste. A list of licensed contractors is available on the Irish EPA website at www.epa.ie (A search facility for waste licences is available on the home page).

Upon ultimate disposal of the waste a certificate of disposal will be issued to the producer of the waste. A copy of all waste documentation (e.g. C1 forms, TFS documents) should be kept by the producer of the waste and maintained (along with other related waste documentation) for a minimum of 7 years.

ODS can only be destroyed by approved methods, the most common of which is high temperature incineration. No such facilities are available in Ireland at present, however they are available within the European Community, hence transfrontier shipment will be required for disposal of ODS.

6. REPORTING REQUIREMENTS

Producers, importers and exporters

Producers, importers and exporters of ODS are required to report annually to the Commission, according to the requirements set out in Article 19 of Regulation 2037/2000, copying any such report to the Environmental Protection Agency. There are no known producers of ozone depleting solvents in Ireland.
Essential use

Essential users authorised by the Commission are required to submit a report to the Commission by 31 March every year, according to the details requested in Article 19 of the Regulation. Further information is available on the Commission’s website: http://europa.eu.int/comm/environment/ozone/ods.htm

Process Agent Use

Any undertaking using ODS as a processing agent must report to the Commission by 31 March each year detailing the quantities used during the previous year and an estimate of the emissions which occurred during such use, in accordance with Article 19 of the Regulation.

7. ALTERNATIVES

The guidance provided below may be of use in identifying more suitable alternatives or developing processes on site to further minimise the overall use of solvents (which are likely to have potential health and other environmental impacts).

As part of the Solvents Directive (Council Directive 1999/13/EC) the European Commission recommended that alternatives be selected on the basis of

- fitness for use;
- potential effects on human health and occupational exposure;
- potential effects on the environment, and
- the economic consequences, in particular, the costs and benefits of the options available.

There has been significant progress in the development of alternatives to ODS solvents. The alternative approaches can be placed into five categories as detailed in Table 2.

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Table 2 Alternatives to ODS Solvents (adapted from DEFRA/DTI, 2001^7)

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid Cleaning</td>
<td>This has become popular in the electronics market where specially formulated no-clean fluxes and solder pastes are being used. The burden of cleaning can also be reduced by switching to a water soluble fluid or improving process technology. 100 kg of clothes dry-cleaned two decades ago would have consumed 10 kg of perchloroethylene, while modern equipment performs the same job with little more than 1 kg.</td>
</tr>
</tbody>
</table>
| Volatile Solvents      | The most common chlorinated solvents that are not regulated as ozone depleters and that are suitable for cleaning metal and precision engineered parts:  
  Trichloroethylene (trichloroethene)  
  Perchloroethylene (tetrachloroethene)  
  Methylene Chloride (dichloromethane)  
  These solvents however are subject to the requirements of the EC Solvents Directive, which sets emission limits for volatile organic compounds from specified solvent-using industries. The directive is designed to yield a 67% reduction in VOC emissions and existing installations must comply by 2007 at the latest. Specific consideration should also be given to health and safety (e.g. occupational exposure) in relation to use of these compounds.  
  HFC, HFE and PFC Solvents, are useful as solvents or as carriers for other solvents. However, HFCs and PFCs are will be regulated under the upcoming European Commission Regulations on certain fluorinated greenhouse gases.  
  Volatile Flammable Solvents are commonly used and work well on non-ionic contaminants such as oils and greases. They include, Methyl alcohol (methanol), Isopropyl alcohol (isopropanol), Methyl ethyl ketone (MEK), Ethyl acetate and butyl acetate. These solvents are also subject to the requirements of the EC Solvents Directive. |
| Low Volatility Solvents| There are many hydrocarbons and oxygenated hydrocarbon solvents that do not evaporate readily at room temperature have lower flammability and have excellent solvency for oils and greases. The solvents included terpenes (from vegetation), petroleum distillation by-products or other synthetic chemicals. |
| Water                  | Oils, grease, rosin fluxes and other non-ionic contaminants can be cleaned with water once they have been solubilised or emulsified. When cleaning electronic assemblies the only contaminant of concern is flux. It is possible to formulate and use a flux that is removable by water alone. The main disadvantage is that they are formulated with stronger acidic activity. |
| Non Solvent Processes  | There is an expanding range of other processes for cleaning surfaces, such as blasting the surface with air or microscopic particles of dry ice, plasma cleaning, steam cleaning, supercritical fluids or decamping and volatilising the contamination using ultra violet light or a vacuum –thermal process. These are generally not applicable to all soils and surfaces. |

These alternatives are currently being promoted by the Commission as detailed on their website (http://ec.europa.eu/environment/ozone/alternatives.htm).

Useful information on the available alternatives to ODS solvents is also available from the USEPA (http://www.epa.gov/ozone/snap/solvents/index.html).

All ODS solvent users are strongly recommended to contact their suppliers and/or industry associations to discuss their specific circumstances. In addition, a large body of research is available regarding the application of ODS solvent alternatives, both within the EU and elsewhere.

8. ENFORCEMENT AND PROSECUTION

The Environmental Protection Agency has been officially designated as competent authority for the implementation and enforcement of Regulation (EC) No. 2037/2000 by Article 6 of the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006). In addition, supporting roles have been assigned to three competent bodies as follows:

- Department of Agriculture and Food
- The Revenue Commissioners
- The Maritime Safety Directorate

With the support of relevant competent bodies, the EPA will continue, and expand where necessary, its current contacts with the relevant sectors with the view to ensuring compliance and gathering data to meet reporting requirements.

Any breaches of the Regulation will be regarded seriously by the Agency and the competent bodies. Prosecution is provided for under Article 12 of the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006).

9. OTHER SOURCES OF INFORMATION

*Competent Authority - Environmental Protection Agency*

Ozone Depleting Substances  
Office of Licensing and Guidance  
Environmental Protection Agency  
PO Box 3000  
Johnstown Castle Estate  
Co. Wexford  
Phone: 053 9160600  
Website: www.ozone.ie
Government Body - Department of the Environment, Heritage and Local Government

Air/Climate Section
Department of the Environment, Heritage and Local Government
Customs House
Dublin 1
Phone: 01 8882000
Website: www.environ.ie/en/Environment/Atmosphere/ProtectionoftheOzoneLayer/

Competent Bodies –
Department of Agriculture and Food

Pesticide Control Service  
Department of Agriculture and Food Laboratories  
Backweston Campus  
Young’s Cross  
Celbridge  
County Kildare
Phone: 01 6157552  
www.pcs.agriculture.gov.ie/

Forest Service  
Department of Agriculture and Food Agriculture House  
Kildare Street  
Dublin 2  
Phone: 1 6072000  

Revenue Commissioners (Customs Division)

Office of the Revenue Commissioners  
International and Trade Security Branch  
Customs Division  
Nenagh  
Co. Tipperary
Phone: 067 63400
Website: www.revenue.ie

- Maritime Safety Directorate

Maritime Safety Directorate  
Department of Transport  
Leeson Lane  
Dublin 2  
Phone: 01 6786400
Website: www.transport.ie/marine/MaritimeSafetyDirectorate/index.asp?lang=ENG&loc=1933

Useful Websites

- http://www.uneptie.org/ozonaction/
- http://ozone.unep.org/
• http://ec.europa.eu/environment/ozone/index.htm
• http://www.euro.who.int/globalchange/topics/20020627_1
• http://www.epa.gov/ozone/snap/
• http://www.hsa.ie
Appendix A - Examples of Permitted Laboratory Use
Categories and Examples of Laboratory Use (not exhaustive)\(^8\)

- Research and development (eg. pharmaceutical, pesticide, CFC and HCFC substitutes)
  - Reaction solvent or reaction feedstock (eg. Diels-Alder and FriedelCraft Reactions, RuO3 oxidation, allelic side bromination, etc.)
- Analytical uses and regulated applications (including quality control).
  - Reference:
    - Chemical (ozone depleting substance monitoring, volatile organic compound detection, equipment calibration).
    - Toxicant.
    - Product (adhesive bond strength, breathing filter test).
  - Extraction.
    - Pesticide and heavy metal detection (eg. in food)
    - Colour and food additive detection.
  - Diluent.
    - Zinc, copper, cadmium detection in plants and food.
    - Microchemical methods to determine molecular weight or oxygen.
    - Measuring drug purity and residual determination.
    - Sterilisation of lab equipment.
  - Carrier (Inert)
    - Titration (cholesterol in eggs, drug chemical characteristics, "iodine value", eg. in oils and chemical products).
    - Analytical equipment (spectroscopy (infra-red, ultra-violet, nuclear magnetic resonance, fluorescence), chromatography (high-pressure liquid chromatography, gas chromatography, thin-layer chromatography).

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\(^8\) This is based on the information on examples of laboratory use included in Annex IV of the ‘Report of the 7th Meeting of the Parties to the Montreal Protocol’.
Revised Guidance Note for Ozone Depleting Substances
Ozone Depleting Solvents

- Tracer.
  - Sanitary engineering.
- Miscellaneous (including testing).
  - Ingredient in material for testing (e.g., asphalt, metal fatigue and fracturing).
  - Separation media (separation of extraneous materials such as filth and insect excreta from stored food products).
- Miscellaneous (including biochemical).
  - Laboratory method development.
  - Sample preparation using solvent.
  - Heat transfer medium.

The parties to the protocol decided to eliminate (from 2002) a number of previous allowed laboratory uses, namely:

- Testing of oil, grease and total petroleum hydrocarbons in water;
- Testing of tar in road-paving materials;
- Forensic finger-printing.
Appendix B - ODS Waste Management Guidance
1. WASTE CLASSIFICATION

Most waste ODS and used ODS containers\(^9\) are classified as hazardous substances. Waste is classified across the EU according to the European Waste Catalogue and Hazardous Waste List\(^10\). Most of the ODS are covered under the following chapters of the catalogue:

**ODS substances (gases, solvents, etc.)**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>Wastes from organic chemical processes (this section includes codes for solvents used in a wide range of organic chemical industries)</td>
</tr>
<tr>
<td>08</td>
<td>Wastes from the manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), sealants and printing inks</td>
</tr>
<tr>
<td>14</td>
<td>Waste organic solvents, refrigerants and propellants (except 07 and 08)</td>
</tr>
</tbody>
</table>

**For equipment containing ODS**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Wastes from electrical and electronic equipment (including CFC, HCFC and HFC)</td>
</tr>
<tr>
<td>20</td>
<td>Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions</td>
</tr>
</tbody>
</table>

The European Waste Catalogue and Hazardous waste list can be downloaded from the following web site: [http://www.epa.ie/whatwedo/resource/nwr/](http://www.epa.ie/whatwedo/resource/nwr/)

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9 Containers that were used to transport ODS that are now empty or are nominally empty and are to be disposed of.

The special provisions referred to above can only be made by persons meeting the following conditions:

- the activity is incidental to the main business
- the activity is small-scale, leading to environmentally beneficial operations
- the quantity transported does not exceed 2 tonnes
- no mixing of different gases occurs
- the material is brought to an authorised facility\(^\text{11}\)
- handling and transport should prevent venting or leakage
- the material is recycled or destroyed according to relevant requirements

2.2 Transport of Hazardous Waste within Ireland (C1 form)

The movement of hazardous waste point to point within Ireland must be accompanied by a C1 form in accordance with the Waste Management (Movement of Hazardous Waste) Regulations, 1998\(^\text{12}\). However, a number of exemptions apply, under Article 35 of the Collection Permit Regulations\(^\text{13}\).

In practical terms, the C1 form must be completed at each stage of a journey. The form has five carbon copies. By the time the shipment is ended, one copy will be with the originator of the waste, one copy will be with the authorised destination facility, one copy will be with the local authority that issued the blank C1, one copy will be with the destination local authority and one copy will be retained by the carrier.

C1 forms may be obtained from the local authority in whose area the waste is collected. For more information on C1 forms, contact your local authority.

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\(^\text{11}\) An authorised facility is a facility that has been granted an waste/site authorisation in the form of a waste licence, a waste facility permit or a certificate of registration


\(^\text{13}\) S.I. No. 820 of 2007 Waste Management (Collection Permit) Regulations, 2007, amended by S.I. No. 87 of 2008
2.3 Export of Waste outside of Republic of Ireland

Any movement of waste from a point within Ireland to a point outside of Ireland is governed by the EU Transfrontier Shipment of Waste Regulation (1013/2006)\textsuperscript{14}. For the export of hazardous waste, a transfrontier shipment (TFS) notification must be made, and authorisation to proceed obtained, prior to the export of waste taking place. No export of waste should take place without the appropriate authorisations having been received from the competent authorities in Ireland, the destination country and transit countries\textsuperscript{15}.

Dublin City council is designated as the National Competent Authority for export, import and transit of waste shipments under the Waste Management (Shipment of Waste) Regulations 2007\textsuperscript{16}. Further information can be obtained from the National TFS Office in Dublin City Council: www.dublincity.ie.

A TFS notification is consists of two parts:

1) Notification form, which must be completed before waste is moved. This form provides all the information necessary to obtain the advance consent of the competent authorities.

2) Movement Tracking Form, which accompanies the shipment when it is moved. It provides information on the actual movement of each waste load.

When the waste is received at its destination, the “consignee” issues a certificate of receipt confirming that the waste has reached its authorised destination. Upon disposal of the waste, the consignee issues a certificate of disposal confirming that the waste has actually been destroyed.

3.0 STORAGE, TREATMENT, RECYCLING, DISPOSAL (AUTHORISED FACILITIES)

Waste may only be stored, treated, recycled or disposed of at authorised facilities. Depending on the type and scale of activity, authorisation may be in the form of an EPA waste licence or a local authority waste facility permit.

A waste licence is typically required for any facility where hazardous waste is stored, treated, recycled or disposed of. This will include any transfer station for ODS in the form of packaged chemical waste, for example, bottles of waste CFC or drums of


\textsuperscript{15} For example, an export of waste from Ireland to Germany is likely to pass through the Netherlands. In this case the competent authority of destination will be located in Germany and the competent authority of transit will be located in the Netherlands.

waste solvent being shipped abroad for disposal by incineration or other means. A list of all licensed facilities in Ireland may be found at: http://www.epa.ie/terminalfour/wasteApril/index.jsp

A waste facility permit is typically required for non-hazardous waste recycling facilities. This typically includes any facility that handles fridges and freezers and general electrical and electronic equipment. Waste Facility Permits are issued by local authorities.

For specified waste activities, certain facilities can operate under a Certificate of Registration issued by a local authority or the EPA.

Further information on licensing, permitting and certificates of registration can be obtained from the EPA website: http://www.epa.ie/terminalfour/wasteApril/index.jsp

Before you use any facility for the storage, treatment, recycling or disposal of waste for which you are responsible, ask for a copy of the facility’s authorisation. If you have any doubts about the facility, check with the appropriate regulator (EPA or local authority) and do not use the facility unless you have seen and are wholly satisfied with the authorisation in place.

3.1 Practicalities of Collection, Transport, Storage, Treatment, Recycling and Disposal

In practical terms, the generator/owner of waste ODS may decide to dispose of the waste in either of two ways;

1) Recover and transport the waste to an authorised waste facility for storage and treatment,

or

2) Employ the services of a waste contractor to collect the waste on the owner’s behalf and transport it to an authorised waste facility.

There are a large number of waste contractors authorised to handle the collection and transport of hazardous waste. These companies will typically provide a full service and deal with all authorisation processes for the transport, storage and export of waste.

As above, do not use any waste contractor that cannot provide evidence of waste collection permits (in respect of any collection and transport of waste) and waste facility permits or licences (in respect of any facility in Ireland to which the waste will be delivered). If exporting waste, ensure that the contractor complies with all transfrontier shipment of waste legislation.

If you intend using a waste broker or dealer to handle your waste, you must ensure that the broker is registered with the National TFS Office. A waste broker arranges to
handle, transport, dispose of or recover controlled waste on behalf of others. Waste brokers include waste dealers who acquire waste and sell it on\textsuperscript{17}.

There are also “Duty of a holder of waste” requirements under Section 32 (1) of the Waste Management Act 1996, that one must be aware of regarding the holding, collection and movement of waste;

\begin{quote}
32 (1) “A person shall not hold, transport, recover or dispose of waste in a manner that causes or is likely to cause environmental pollution”.\textsuperscript{18}
\end{quote}

With regards to the storage of waste, The Waste Management Act 1996 defines 'temporary storage' as the storage of waste for a period not exceeding 6 months. The storage of waste greater than 6 months would be deemed a waste disposal or waste recovery activity and would require authorisation from the relevant local authority or the EPA.

Note that the use of unauthorised waste contractors may leave you liable for prosecution if your waste was found to have been handled illegally.

\textsuperscript{17} S.I. No. 113 of 2008 Waste Management (Registration of Brokers and Dealers) Regulations, 2008

\textsuperscript{18} Section 32 (1) of the Waste Management Act 1996
USER COMMENT FORM

Completed forms to be sent to:

**Ozone Depleting Substances**
Office of Licensing and Guidance
Environmental Protection Agency
PO Box 3000
Johnstown Castle Estate
County Wexford
Ireland
Fax: 053 60699
E-mail: ods@epa.ie  Web: www.ozone.ie  and  www.epa.ie

CONTENTS

STYLE:

INFORMATION:

SUGGESTIONS FOR FUTURE REVISIONS:

NAME…………………………….ORGANISATION……………………………………
ADDRESS…………………………………………………………………………………
DATE……………………….PHONE……………………….FAX…………………………
E-MAIL………………………WEB…………………………