

PHASE OUT OF OZONE DEPLETING SOLVENTS

**Advice on alternatives and
guidelines for users of CFC, HCFC
and 1,1,1-Trichloroethane**

This leaflet has been produced by DEFRA/DTI to provide guidance to industry on the likely consequences of the new EC Regulation. It should not be relied upon as a definitive statement of the law and is not a substitute for legal advice. Interpretation of the law is a matter for the courts. DEFRA and DTI accept no liability for any loss resulting from reliance on this document.

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Glossary of terms

CFC	chlorofluorocarbon	ODS	ozone depleting substances
HCFC	hydrochlorofluorocarbon	ODP	ozone depletion potential
HFC	hydrofluorocarbon	GWP	global warming potential
HC	hydrocarbon	VOC	volatile organic compounds
PFC	perfluorocarbon	MEK	methyl ethyl ketone
HFE	hydrofluorocarbon ether	COSHH	Control of Substances Hazardous to Health

Aim of this Guide

This Guide provides details of how the new EC Regulation 2037/2000 on ozone depleting substances (ODS) will affect the use of ozone depleting solvents. The Guide is aimed at all key parties in the solvent market including users, designers, equipment manufacturers and solvent suppliers.

The solvents affected by the new EC Regulation are CFC 113, 1,1,1-trichloroethane and HCFC (hydrochlorofluorocarbon) solvents such as HCFC 141b.

This Guide has been published as one of a set of four booklets addressing the new EC Regulation 2037/2000 on substances that deplete the ozone layer. The other booklets include a general guide on the EC Regulation and two further detailed guides addressing the refrigeration/air-conditioning and fire-fighting markets.

Users of ozone depleting solvents need to be aware of a number of significant changes introduced by the new EC Ozone Regulation. The aim of this Guide is to outline these changes and to help users decide on appropriate action plans. Details of how to obtain further help are also given at the end of this booklet.

Phase out Dates

CFCs including CFC-113

PRODUCTION AND IMPORT PHASE OUT BY 31st DECEMBER 1994
COMPLETE BAN ON TRADE AND USE¹ BY 1st OCTOBER 2000

1,1,1-trichloroethane

PRODUCTION AND IMPORT PHASE OUT BY 31st DECEMBER 1995
COMPLETE BAN ON TRADE AND USE BY 1st OCTOBER 2000

HCFC Solvents

BAN OF USE IN OPEN SYSTEMS FROM 1st JANUARY 1996
GENERAL USE BAN² FROM 1st JANUARY 2002

1 Use in all instances, includes use of stockpiled material. "Use" is defined in EC Regulation 2037/2000 as the utilisation of controlled substances in the production or maintenance, in particular refilling, of products or equipment or in other processes except for feedstock and processing agent uses.

2 There are certain exemptions to the HCFC use ban e.g. a temporary exemption for precision cleaning of electrical and other components in aerospace and aeronautics applications where the use ban shall enter into force on 31 December 2008.

Phase Out Legislation

The ban on trade in CFC-113 and 1,1,1-trichloroethane refers to placing on the market in the EU and exports of these substances outside the EU. The trade ban applies to all sources of material, including recovered and recycled solvent.

The definition of “use³” refers to use for topping up and maintaining equipment. As all solvent systems require regular replacement of solvent because of fugitive and contamination losses, a use ban means it will not be possible to operate equipment containing ozone depleting solvents as soon as it requires topping up from the dates given in the above table.

There are certain temporary exemptions from the use ban for HCFC solvents. These are for precision cleaning of electrical and other components in aerospace and aeronautics applications. For these exempted applications the use ban enters force on 31st December 2008.

Are you affected?

CFC-113 and 1,1,1-trichloroethane were most commonly used as proprietary blends with other solvents and with stabilisers. HCFC solvents are marketed similarly. The range of trade names included:

Algofrene [®]	Arklone [®]	Baltane [®]	Chlorothene [®]	Delifrene [®]
Dional [®]	Dowclene [®]	Flonshowa [®]	Flugene [®]	Fluorisol [®]
Forane [®]	Freon [®]	Frigen [®]	Fronsolv [®]	Genklene [®]
Gensolv [®]	Isceon [®]	Isotron [®]	Kaltron [®]	Prelete [®]
Propaklone [®]	Racon [®]	Triflon [®]		

³ Use in all instances, includes use of stockpiled material. “Use” is defined in EC Regulation 2037/2000 as the utilisation of controlled substances in the production or maintenance, in particular refilling, of products or equipment or in other processes except for feedstock and processing agent uses.

Typical Applications of these Fluids

INDUSTRIAL APPLICATIONS

Industrial applications include such activities as:

- Electronics defluxing: mainly CFC-113, cleaning to well established cleanliness levels
- Precision cleaning: CFC-113 and 1,1,1-trichloroethane, cleaning to required levels of cleanliness
- Metal cleaning: mainly 1,1,1-trichloroethane, general degreasing of surfaces (not necessarily metallic), with variable standards of cleanliness
- Adhesive formulations

Most defluxing and precision cleaning with solvents like CFC-113, 1,1,1-trichloroethane and HCFCs is carried out in vapour cleaning plant. Metal cleaning may also be performed in a vapour cleaning plant but is also done by wipe cleaning (with a cloth or brush etc.) or by cold cleaning (immersion or spraying with liquid solvent).

In addition there is a large number of manufacturing and other process operations, ranging from vapour phase soldering to fingerprint detection that have relied on ozone depleting solvents.

Dry Cleaning of Textiles

Dry cleaners have traditionally used ozone depleting solvents including CFC 113 and 1,1,1-trichloroethane. Under the new EC Regulation the use of these substances in dry cleaning is prohibited from 1st October 2000. In addition HCFCs including HCFC 141b, HCFC 123 and HCFC 225 have all been used. The use of these substances in dry cleaning is prohibited from 1st January 2002. The alternative options available to the dry cleaning industry are discussed on page 6.

How should industrial users respond to Phase Out?

This advice is directed primarily at the largest use of solvents - to clean parts during manufacture, service and maintenance. However, the issues are relevant to all solvent uses.

Establish which solvents you are using

Do they contain ozone depleting CFC-113 or 1,1,1-trichloroethane (methyl chloroform) or HCFCs? Find out if you are affected by checking the list of trade names above and your solvent safety data sheets. If in doubt, contact your equipment or solvent supplier or the solvent manufacturer for further advice.

Establish your real need to clean

The best course of action is to eliminate some cleaning operations or to reduce the burden of cleaning by minimising contamination. Reducing cleaning requirements can be very cost effective (providing product reliability is not jeopardised). Even with non-ozone depleting solvents, reducing the cost of meeting emission controls, saving solvent, cutting recycling costs and reducing waste disposal costs are all worthwhile considerations.

Identify the possible cleaning alternatives and judge their feasibility

There are a few classes of options and this Guide will help you reach a decision. There may be many commercial alternatives within each class but it is possible that one or more classes can be ruled out straight away because they are incompatible with your product specification.

Consider the technical performance of the alternatives

How clean do you have to clean? How do you measure your cleanliness? In general the alternative solvents and systems can clean at least as well as ozone depleting solvents. In some cases, the alternatives have less desirable attributes; they may be more toxic, or flammable or require the product to be dried after cleaning.

Review the commercial products available

In most cases, changing a cleaning process will require new or substantially modified equipment as well as new solvent. You should consider and evaluate the cleaning process as a whole. A commercial cleaning system should be assessed in terms of product throughput and running costs as well as capital cost. Health and safety and environmental implications of an alternative process must also be considered carefully.

How should dry cleaners respond to Phase Out?

Establish which solvents you are using

If you are a dry cleaner, you should first establish which solvents your equipment uses. You should be able to do this by referring to the packaging in which the solvents were supplied. You can find out if you are affected by checking your equipment and your solvent safety data sheets.

Does your equipment use any of the following ozone depleting solvents?

- CFC-113 (sometimes sold under trade names “Arklone[®]” or “Valclene[®]”)
- 1,1,1-trichloroethane (sometimes referred to as methyl chloroform)
- HCFCs

If in doubt, contact your equipment or solvent supplier and the solvent manufacturer.

The names used for solvents can often be confusing. In this booklet a prefix CFC or HCFC has been used. This is helpful as it clarifies what type of solvent is being referred to. Unfortunately, the prefixes are often not used - they are replaced with a trade name. Hence CFC 113 may also be Arklone[®] or Valclene[®]. If in doubt, contact your equipment or solvent supplier and the solvent manufacturer.

- If your equipment uses CFC-113 or 1,1,1-trichloroethane you need to act now.
- If your equipment uses HCFCs you must switch to a different solvent by 1st January 2002 and you should start to plan for change now.

Identify the possible cleaning alternatives and judge their feasibility

One alternative which is on the market is perchloroethylene, which has been used in dry cleaning for around 40 years. It is often referred to as “Perc” and is sold under the trade names “Perklone®” and “Dowper®”. Another alternative you could consider is the use of hydrocarbon solvents with forced evaporation.

However, in taking your decision, you should bear in mind that chemicals are constantly under review in various European and domestic committees for any adverse environmental or human health effects and their use, regulated or phased out in the future.

Therefore, before taking a decision, and certainly before buying new equipment, detailed advice on your alternative options should be sought from your equipment supplier and your Trade Association (in any event you should keep in constant contact with your Trade Association) (Fabric Care Research Association (FCRA) Tel: 01423 885 977, Textile Services Association (TSA) Tel: 020 8863 7755. A list of suppliers, taken from Laundry & Cleaning Today, in the UK is provided below:

Dry cleaning Equipment Suppliers	Telephone
Automatic Laundry Services	01382 461706
CCS	020 8533 0704
Dane Dry Cleaning Systems	01403 741414
Drytech	01732 362 611
Drycleaning & Laundry Services	0131 6635956
Duval	01794 517978
Firbimatic UK ltd	01386 555582
Ilsa spa	+39 051 815154
James Bohan Services	+353 2222347
Multicare Systems	01375 398767
National Laundry & Drycleaning Equipment	+353 14518343
Parrisianne plc	01737 830007
Quality Steam Services Ltd	020 7254 5216
Renzacci UK plc	020 8579 2661
Southern Drycleaning Systems	01635 43732
Textile Care Supplies Ltd	01592 741839

Environmental Issues

Your present CFC-113 or 1,1,1-trichloroethane process can no longer be operated and, with the exception of use in aerospace and aeronautics, you will not be able to use HCFC solvents from the end of 2001. Furthermore, any of these solvents that are in equipment at that date must be removed and disposed of in an approved way. This situation arose because of the environmental impact of these solvents and the alternative you choose may also affect the environment and its use may be regulated in some form. The present and possible future costs of complying with environmental regulations should be taken into account in making your choice.

Ozone Depletion

The ozone depletion potential (ODP) of a substance is an indication of its ability to harm the stratospheric ozone layer. CFC-113 has an ODP of 0.8 and 1,1,1-trichloroethane an ODP of 0.1. HCFC 141b has an ODP of 0.11.

The previous EC regulation on ozone depleting substances (EC Regulation 3093/94) banned the use of HCFCs as solvents in open systems from 1 January 1996. Under the new EC Regulation (EC 2037/00), use of HCFC solvents is banned from 1st January 2002 in all solvent uses with the exception of precision cleaning of electrical and other components in aerospace and aeronautics applications. Use in these areas will be prohibited on 31st December 2008.

Global Warming and the Kyoto Protocol

Hydrofluorocarbons (HFCs) and Perfluorocarbons (PFCs) are important alternatives and replacements for some uses of ozone depleting substances. They are not ozone depleting gases and therefore are not covered by the Montreal Protocol but they are greenhouse gases (along with carbon dioxide, methane, nitrous oxide and sulphur hexafluoride). The UK's target under the Kyoto Protocol is to reduce emissions of all these greenhouse gases together, by 12.5% based on 1990 or 1995 levels in the years 2008-2012.

The Government's strategy to meet this target, is set out in the UK Climate Change Programme. It is beneficial for the environment to select a fluid with low Global Warming Potential (GWP). PFCs in particular have very high GWP.

Volatile Organic Compounds

Volatile Organic Compounds (VOCs) are precursors of ground level photochemical smog and their emissions are regulated. Under the EC Solvents Directive (1999/13/EC), which is largely implemented in the UK under Integrated Pollution Control, there are specific thresholds for consumption and emission controls for individual processes in the following industries:

printing, surface cleaning, surface coatings (including vehicles), dry cleaning, wood-working, leather and footwear, rubber conversion, vegetable oil and fat extraction and refining, and pharmaceuticals manufacture.

At the very least, these require solvent management plans and may require equipment or process modifications to measure and control emissions. The Solvent Emissions Directive (SED) can be viewed at http://www.europa.eu.int/eur-lex/en/consleg/pdf/1999/en_1999L0013_do_001.pdf

Although the present UK Local Air Pollution Control and Integrated Pollution and Prevention Control schemes largely implement the requirements of the SED, there are some small-scale activities for which new regulations are required, including dry cleaning and small-scale solvent degreasing. The Department of Environment, Food and Rural Affairs are currently resolving any inconsistencies in the legislation and consulting with the industries involved.

The Solvent Emissions Directive limits for PERC and Hydrocarbon for dry cleaners are set at 20 grams per kg expressed by mass of product cleaned and dried.⁴

Effluent Disposal

Many alternative cleaning technologies include a water based wash or rinse. Before it is eventually discharged, the effluent from this will require treatment and, depending on the requirements of Integrated Pollution Control or any other environmental regulations, this will have to be done on site or by the water company who operate the trade sewer. Discharge consents are set in terms of pH, oxygen demand and aquatic ecotoxicity. Contact your local Environment Agency office for advice on this matter.

⁴ In fact for halogenated VOCs labelled R40 the limit is 20mg Substance/m³ which is even lower.

Waste Disposal

Waste CFCs, HCFCs and 1,1,1-trichloroethane are already controlled by the waste management controls in the Waste Management Licensing Regulations 1994 and the Environmental Protection Act 1990. The relevant provisions are sections 33(1)(c) and 34 of the 1990 Act, which are designed to ensure that waste travels only along legitimate routes towards proper disposal or recycling without harm to the environment or health.

Section 33 prohibits the disposal and recovery of waste in a manner likely to cause pollution of the environment or human health. The duty of care imposed under section 34 requires all producers and holders of waste (except householders) to take all reasonable steps to keep the waste safe and ensure it is treated lawfully. Anyone concerned with controlled waste must ensure it is managed properly, recovered or disposed of safely; and must only transfer it, with a description of the waste, to someone who is authorised to receive it. Those authorised to receive controlled waste are registered waste carriers or brokers, local authority waste collectors and waste operations with a waste management licence or registered exemption from licensing.

Taken together, these provisions oblige the producer and holders of waste CFCs, HCFCs and 1,1,1 trichloroethane to prevent, as far as reasonable in the circumstances, their release to the atmosphere through their own actions or those of others. You should therefore take great care to avoid any discharge of such controlled wastes and to ensure that all who handle them are authorised for the purposes of the duty of care.

It is likely that most waste ODS will be "special waste" and so subject to more stringent disposal arrangements than most other wastes. Special rules also apply to their import and export. You should contact your local Environment Agency office for further information.

Health and Safety Issues

Although there are no specific regulations relating to the selection and use of cleaning systems, these activities fall within the scope of more general health and safety legislation. The Management of Health and Safety at Work Regulations 1999 (Management Regs.) requires all risks at work to be assessed and prevented, or, where this is not reasonably practicable, adequately controlled.

If the cleaning system contains a hazardous substance (most vapours other than simple asphyxiants and flammable liquids are hazardous substances), then the Control of Substances Hazardous to Health Regulations 1999 (COSHH) will also apply. Both the Management Regs. and COSHH are supported by Approved Codes of Practice that give additional information on the regulations and guidance on how to comply. The emphasis in both the Management Regs. and COSHH is that prevention of the risk should be considered before control of the risk.

Specific legislation applies to the transportation, storage and use of flammable materials, particularly those with lower flashpoints.

The choice of alternative cleaning technology must take due account of the requirement to minimise fire risks and prevent or control operator exposure, including possible monitoring. Both of these have cost implications but experience shows that such costs need not be a burden and there may be opportunities to reduce the overall cost of cleaning.

The Alternative Approaches

Most cleaning operations require the removal of ionic, non-ionic and particulate contaminants. The de-fluxing of electronic assemblies is a special case because, generally, the only contaminant is the acid flux and therefore particular solvents and processes have been developed. The alternative approaches to cleaning can be placed into five categories:

- avoiding cleaning
- use of volatile solvents
- use of low volatility solvents
- use of water
- use of non-solvent processes

A table on the next page summarises the applicability of various alternatives to ozone depleting solvents.

	Metal and Precision Cleaning	Electronics De-fluxing	Dry-Cleaning	Adhesive Formulation
1: Avoid Cleaning				
just stop cleaning	√	√	X	X
change process	X ^(a)	√ ^(b)	X	√
2: Volatile Solvents				
chlorinated solvents	√	X	√	√
HFC, HFE and PFC solvents	√	√	X	√
alcohols, ketones and esters	√	√	X	√
3: Low Volatility Solvents				
hydrocarbon solvent, forced evaporation	√	√	√	√
hydrocarbon solvent, volatile solvent dry	√	√	NA ^(c)	NA
■ hydrocarbon solvent, water rinse, dry	√	√	NA	NA
■ hydrocarbon/ water emulsion, water rinse, dry	√	√ ^(d)	NA	NA
4: Water				
■ water plus detergent	√	√	X	√
■ change process	X	√	NA	√
5: Non-Solvent Processes				
■ dry-ice blasting	√	X ^(e)	X	X
■ supercritical carbon dioxide	√	√	X	X
■ plasma	√	X ^(e)	X	X
■ thermal vacuum	√	X	X	X
■ UV/ozone	√	X ^(e)	X	X
■ steam cleaning	√	X	X	X

Notes to table

√ means the alternative can be considered for the application

X means the alternative is not suitable for the application

(a) whilst there may be opportunities to change a process route and eliminate a cleaning step, the specification requires that the contamination will be removed by cleaning.

(b) 'no clean' fluxes

(c) NA means Not Applicable (as against X which signifies not suitable)

(d) water soluble flux

(e) These processes are capable of removing flux and handling contamination from bare circuit boards but may be restricted in cleaning under components.

Option 1: Avoid Cleaning

JUST STOP CLEANING

Cleaning operations can be eliminated by avoiding soiling an already cleaned item, such as by handling it only with gloves or special tools. The burden of cleaning can be reduced by changing the nature of soils to make cleaning easier, for example by using water soluble cutting fluids that can be rinsed off with water alone.

CHANGE TO A 'NO CLEAN' PROCESS

This has gained a major share of the electronics market. The reason that soldered assemblies are cleaned is to avoid insulation of contact points and gumming-up of probes during testing, to avoid having to handle sticky product, to give an opportunity to clean off other harmful contaminants such as solder balls or to enable conformal coatings to be applied. The use of specially formulated no-clean fluxes and solder pastes can overcome these problems at the expense of some flexibility of processing.

No-clean fluxes and solder pastes are not drop-in replacements. A no-clean process is more vulnerable to variations in process parameters. Its use significantly narrows the processing window available for component solderability, handling, flux application and preheat. The process window can be widened, for example by soldering in an inert atmosphere.

Option 2: Volatile Solvents

CHLORINATED SOLVENTS

There are three common non-flammable, chlorinated solvents, not regulated as ozone depleters, that are suitable for cleaning metal and precision engineered parts:

- trichloroethylene (trichloroethene)
- perchloroethylene (tetrachloroethene)
- methylene chloride (dichloromethane)

They have all been used for vapour cleaning for many years and the equipment to do this is widely available and well developed. None is recommended for cold or in situ cleaning because of the difficulty of maintaining the workplace atmosphere below the operator exposure limit.

HFC, HFE AND PFC SOLVENTS

Not to be confused with HCFCs (general use of which will be banned from 2002), these substances do not contain chlorine and do not deplete the ozone layer. HFC stands for hydrofluorocarbon, HFE for hydrofluorocarbon ether and PFC for perfluorocarbon. Some of these materials are useful as solvents or as carriers for other solvents. HFCs and PFCs have significant global warming potentials (see page 8) and their emissions count towards the UK's total of greenhouse gases under the Kyoto Protocol.

VOLATILE FLAMMABLE SOLVENTS

These are common solvents that work well on non-ionic contaminants such as oils and greases. They include methyl alcohol (methanol), *isopropyl* alcohol (*isopropanol*), acetone, methyl ethyl ketone (MEK), ethyl acetate and butyl acetate. They have low flashpoints and should not be used for wipe cleaning, in general.

Option 3: Low Volatility Solvents

There are many hydrocarbon and oxygenated hydrocarbon solvents that do not evaporate readily at room temperature, have lower flammability and have excellent solvency for oils and greases. Many have low toxicity and are suitable for wipe and immersion cleaning.

The solvents are either terpenes (from vegetation), petroleum distillation by-products or other synthetic chemicals. They are under continual development by manufacturers, aiming for higher flashpoints and lower vapour pressures (to reduce emissions).

As a general rule, a volatile solvent needs no drying but tends to be highly flammable, whereas a solvent with low volatility has a high flashpoint but does not evaporate readily at room temperature. Such a solvent can be removed by evaporation at high temperature (but with a much increased fire risk) or washed off using water or alcohol. An air knife can be used to remove surface solvent or rinse water, to ease the burden of drying and vacuum drying can be an efficient option in some cases.

Option 4: Water

WATER AND DETERGENT (AQUEOUS CLEANING)

Oils, grease, rosin fluxes and other non-ionic contaminants can be cleaned using hot water but only if the contaminants are first solubilised or emulsified. This is usually done by saponifying the contaminant - converting it chemically into a soluble soap. Detergents emulsify oils and greases and can be highly ionic which can cause serious problems unless copious rinsing follows the wash. Great care must be taken to avoid the detergent or rinse water becoming trapped. High pressure sprays or water curtains are normally used, followed by hot air knives.

WATER AND WATER-SOLUBLE FLUX

When cleaning electronic assemblies and the only contaminant of concern is the flux, it is possible to formulate and use a flux that is removable by water alone. The absence of soap leads to the possibility of recycling of the water.

Water soluble products are usually formulated with stronger acidic activity than rosin fluxes; the residues are more corrosive and more conducting and must always be washed off completely. On the other hand, the stronger activity can allow improved yields, less rework and a more reliable product and water washing is the second preferred option after no-clean technology to deal with flux.

Option 5: 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, using the excellent solvency of supercritical fluids, plasma cleaning, steam cleaning or decomposing and volatilising the contamination using ultra-violet light or a vacuum-thermal process. These are not generally applicable to all soils and surfaces but are worth considering for particular applications.

Making the Choice

Before deciding on a new solvent for *in situ* cleaning or a new cleaning process to replace an existing immersion or vapour process, you will need to consider the technical factors relevant to your products, the feasibility of introducing new plant and techniques into your workplace, the cost implications for your company and the current and future environmental, health and safety legislation, controls and responsibilities.

Feasibility of Introducing a New Process

You need to identify and prioritise the technical factors that control the introduction of a new cleaning system. The production process should be viewed as a whole and the role of cleaning examined, then the cleaning process (including both solvent and equipment) needs to be appraised. Some suggested technical factors are listed, there may be others particular to your process:

- environmental compatibility
- compliance to product specification
- cleaning performance of the process
- health and safety issues
- floor space requirement
- ability to meet spatial requirements for fire safety
- trends in the rest of the industry
- flexibility of the process
- can it cope with the variety of products to be cleaned
- can it meet potential future demands
- impact of up- and down-stream processes
- materials compatibility (ability to clean difficult components, corrosion, swelling etc.)
- fallback position (what is the likelihood that the solvent will need to be changed in the future and what is your strategy for this)
- degree of process control required
- maintenance - extent and cost
- throughput of process, including cycle time
- availability of process (number of suppliers of equipment and solvent)
- future costs of process (energy cost, effluent treatment and waste disposal costs)
- ease of installation (availability of power, water, compressed air, nitrogen, steam etc.)

The Cost of Cleaning

There are the direct costs:

- capital
- installation
- solvent and other consumables
- labour
- energy
- effluent treatment and waste disposal
- maintenance

and also indirect costs, which are much more difficult to quantify. Some factors affecting indirect cost are:

- fitness for purpose (how clean does the product have to be?
Is it being overcleaned - a waste of resources - or undercleaned leading to rework or rejection)
- product manufacturing yield
- product reliability
- disruption of existing process
- operator training (no alternative process can be implemented without a period of learning)
- future costs connected with changes in environmental legislation

Environmental and Safety Factors

- Virtually all organic solvents are VOCs (volatile organic compounds) and their emissions are regulated under Integrated Pollution Control, the Environmental Protection Act and the Solvent Emissions Directive (should be in force from mid 2002)
- Volatile solvents such as alcohols, esters and ketones are often highly flammable and handling and storage are subject to strict controls
- Low volatility hydrocarbon solvents may be flammable or combustible, requiring precautions especially if warmed to increase evaporation
- Many solvents are hazardous to health and are regulated in the UK under COSHH
- The cost of waste disposal and aqueous effluent treatment will encourage the adoption of closed loop processes
- Discharge of many substances such as solvents and heavy metal soils is severely restricted
- The efficacy and cost of controlling atmospheric emissions, liquid effluent streams and solid waste needs to be weighed against the cost of not generating them in the first place
- However, in taking your decision you should bear in mind that chemicals are constantly under review in various European and domestic committees for any adverse environmental or human health effects. Their use may therefore be regulated or phased out in the future.

Summary

- There are many options that are technically viable
- Selection of the best option requires a broad view of all of the considerations and constraints of your particular situation
- Your choice will depend on the circumstances of your operation and will depend on product mix, soils to be removed, throughput and cost
- The only thing that is certain is that you can no longer use the major ozone depleting solvents and that HCFCs will follow them by the end of 2001. If you are using these, you need to do something now.

Useful Information

Contacts

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Website: www.fcra.org.uk

STATIONERY OFFICE LTD (HMSO)
Tel: 0870600 5522
Fax: 0870 600 5533
Email: books.enquires@theso.co.uk

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at Work Regulations Approved
Code of Practice 1999
ISBN 0717624889

Control of Substances Hazardous to
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ISBN 0 717616703

Climate Change - The UK Programme
ISBN 0101491328 Available from
HMSO Publications or DEFRA on
www.defra.gov.uk

Other New DTI/DEFRA Publications

GUIDANCE ON THE IMPACT
OF THE NEW EC REGULATIONS:

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URN 00/1153

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References to the Regulation

The full text of the EC Regulation can
be obtained from the DEFRA.

Electronic versions can be obtained
from the DTI web site
<http://www.dti.gov.uk/access/ozone.htm>

www.dti.gov.uk/access/ozone.htm

