IMPEL
NETWORK
European Union Network for the Implementation
and Enforcement of Environmental Law

IMPEL Workshop
on the Use of Chlorinated Hydrocarbons in Industrial Plants
March 13 to 16, 2000, Ossiach, Carinthia, Austria

FINAL REPORT

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Klagenfurt; June 5, 2000

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Thanks have to be given to all participants of the workshop from 6 member states (Austria, Germany, Ireland, Italy, Portugal and the United Kingdom) and 9 accession countries (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia and Slovenia).

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Klagenfurt, June 2000

Wolfgang HAFNER , Karin MIKLAUTSCH and Bruno WACHTER

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SUMMARY

On March 13-16, 2000 the **IMPEL Workshop on the Use of Chlorinated Hydrocarbons (CHC) in Industrial Plants** took place in Ossiach in Carinthia, Austria. The main objective of this workshop was to compare the situation in the Member States (MS) and Accession Countries (AC) and to give an overview on the current EU-regulations dealing with CHCs. Additionally the workshop offered the opportunity to discuss on the VOC-directive and on the BAT and to give feedback to the European Commission (EC).

The current situation in the MS and AC was presented through contributions of the participants from the MS and AC, practically complemented by two excursions to existing installations using CHCs for degreasing in Carinthia and in Slovenia. It was the first time in the history of IMPEL, that so many civil servants of the AC participated actively in an IMPEL-workshop.

The evaluation of the questionnaire, which was distributed to all MS and AC in advance, indicated that all countries are aware of the problems dealing with CHCs but demonstrated among others that there were great differences in:

- regulations and calculations for fugitive emissions;
- technical standards concerning the use and storage of CHCs;
- monitoring and remediation of contaminated sites;
- limit and threshold values for soil and groundwater;
- implementation of substitution-programmes.

Details were discussed in **four working groups** under the headings:

- air emission limit values in the VOC-directive;
- methods of estimation and calculation of fugitive emissions;
- pollution prevention concerning CHC;
- soil and groundwater remediation.

The results of the working groups were presented by rapporteurs and discussed in the plenary session.

Based on the outcome of the IMPEL workshop the following main conclusions can be drawn:

- The VOC-directive is a starting point in the right direction, but its implementation has to be monitored and the obligation for soil-gas-analysis has to be amended.
- The different technical standard in the MS and AC requires harmonisation in form of BAT or EN-documents.
- Tighter national regulations/standards must still exist beneath VOC – directive
- Generally there is an urgent need for information for the MS as well as for the AC. A data base concerning practices and guidelines in other countries, BAT and alternatives to CHC should be provided by IMPEL.
- There is an urgent need for harmonisation of ECO-funds in order to support the remediation of old contaminated sites, the use of alternatives and substitutes to CHCs and the use of best technologies.

Although some issues were unresolved the workshop proved to be effective and successful by all participants.

The recommendations are addressed to and should be considered by the EC, BAT, EN and IMPEL.

Some of the results and recommendations should also be discussed in the IMPEL 2000 Conference on Environmental Compliance and Enforcement taking place on Oct 11-13, 2000 in Villach, Carinthia.

1. PROJECT DESCRIPTION

Among the chlorinated hydrocarbons the chlorine derivatives of methane and ethane find broad application as solvents. The most important substances are:

- dicloromethane,
- 1,1,1,-trichloroethane,
- trichlorethylene and
- tetrachlorethylene.

Due to their inflammability and excellent liposolubility they are as ever used in industrial processes for cleaning and degreasing, although it is well-known that chlorinated hydrocarbons may cause several impacts on the environment. In order to avoid groundwater and soil contamination caused by the unproper use of chlorinated solvents some Member Sates (MS) have enacted laws and ordinances, respectively with very stringed regulations and limitations (e.g. Germany, Austria), carcinogenic substances are prohibited. Many MS do not regulate or limit the use of chlorinated hydrocarbons in industrial plants. The state-of-the-art in the MS is quite different which already leads to an unfair competition. In addition, the situation in the Accession Countries (AC) can be characterised by a much lower consciousness in the use of chlorinated hydrocarbons. Plants which had to be shut down in MS were exported to AC.

There are no special EU-directives concerning the use of chlorinated hydrocarbons in industrial plants or EU-wide initiatives to forbid these hazardous substances. However, big plants are covered by the IPPC-directive and there are some regulations concerning the emission. The Council Directives 76/464/EEC and 80/68/EEC and their daughter directives limits the discharge into the aquatic environment. The draft of the VOC-directive states that such substances shall be replaced as far as possible and fixes air emission limit values.

1.1. Objectives

Due to current differences across MS and AC a lively exchange of information on the EU-wide practices on the use of chlorinated hydrocarbons in industrial plants could be very helpful. The **IMPEL Workshop on the Use of Chlorinated Hydrocarbons in Industrial Plants,** which took place on March 13 to 16, 2000 in the resort of Ossiach (Carinthia, Austria) served as a platform to

- give an overview of the legal requirements in EU-directives.
- compare legal requirements and their implementation in MS and AC.
- compare licensing and enforcement practices in the MS and AC.
- discuss the demand for common approaches and for EU-wide regulations.

1.2. Preparatory Meetings

For the preparation of the workshop an expert group was formed.

A first preparatory meeting was held in Klagenfurt, Austria (October 18-19, 1999). A second preparatory meeting was also held in Klagenfurt, Austria (February 3, 2000). The purpose of these two meetings was

- to define the main objectives of the workshop,
- to design the questionnaire, which was sent to all MS and AC and
- to confirm the agenda of the workshop including contributors, working groups, chairs and rapporteurs (cf. **ANNEX A**).

A final third preparatory meeting of chairs and rapporteurs was held on the evening before the start of the workshop.

1.3. Questionnaire

In advance to the workshop a questionnaire was circulated among MS and AC (cf. **ANNEX C**) seeking information on the following CHC related topics:

- legal background

- authorities and legal bodies
- chlorinated hydrocarbons
- air emission limit values
- waste water emission values
- measures to prevent contamination of soil and groundwater
- measure to avoid fugitive (diffuse, uncaptured) emissions
- CHC waste
- Best available technology (BAT)
- Cleaner production
- subsidies and incentives
- authorisation / permit / licence
- monitoring
- legal consequences for non-compliances
- final questions

7 questionnaires have been returned from the member states Austria, Germany, Ireland, Italy, Portugal, Sweden and the United Kingdom.

9 questionnaires have been returned from the accession countries: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Slovak Republic and Slovenia. An abstract of this survey was examined and discussed in detail during the workshop. A fully evaluated version of the questionnaire is given in **ANNEX D**.

1.4. Participants

All member states and access countries had been asked to participate and to provide two representatives, i.e. one legislative and one technical expert.

- A total of 43 participants attended the workshop from 6 member states (Austria, Germany, Ireland, Italy, Portugal and the United Kingdom) and 9 accession countries (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia and Slovenia).
- Of this number, 23 participants were from other countries than Austria and from the European Commission.

A full list of all participants is given in **ANNEX B**. Curricula Vitae (CVs) of main contributors, chairs and rapporteurs are given in **ANNEX F**.

2. THE WORKSHOP

The 4 days lasting workshop was divided into

- day 1: plenary sessions (main contributions + national case studies)
- day 2: work groups A,B,C &D
- day 3: excursion to one industrial plantsin Austria and another on Slovenia
- day 4: plenary: resume & final discussion

On the 1st day, in a plenary session 7 main contributions were presented (cf. **Sect. 2.2**):

- Toxicological and Environmental Aspects of CHCs (Wolfram PARZEFALL, Austria).
- Outline of the IPPC-Directive of the EC (Hans Erik WOLDENDORP, European Commission).
- Legislative Background from EC-IPPC, VOC, Water Directives and Other Relevant Community Legislation (Ilse SCHINDLER, Austria).
- History and Development of CHCs (Guenter DUSSING, Austria).
- Technical Standards for Plants Using CHC - Including Technologies to Reduce CHC Emissions) (Wilhelm MUCHITSCH, Austria).
- Alternatives to CHC (Norbert SCHIESS, Germany)
- Results of Questionnaire (Wolfgang HAFNER, Austria)

Again on the 1st day in a plenary session 5 national case studies were presented (**Sect. 2.3**):

- Italy: Groundwater Contamination from Chlorinated Solvents in the North East Region of Italy (Alberto CARNIEL).
- Austria: Investigation and Remediation of CHC-Contaminated Sites in the Province of Upper Austria – Experiences on Problems and Solutions (Dietmar MUELLER, Austria).
- Germany: Surface Cleaning System in a Factory for Watches (Norbert SCHIESS).
- Ireland: CHC Reduction Using Cleaner Production Techniques in the Pharmaceutical Industry (Marie O'CONNOR).
- Slovenia: Substitution of Ozone Depleting Substances (ODS) in Slovenian Industrial Plants (Matjaž NEMANIČ).

On the 2nd, 4 parallel sessions of 4 working groups took place (**Sect. 2.4**):

- Working Group A: Are Emission Limit Values (ELV) in the VOC the best way to protect environment? (Is for CHC the VOC directive sufficient to protect the environment?)
- Working Group B: Methods of Estimation & Calculation of Fugitive Emissions.
- Working Group C: Pollution Prevention Concerning CHC – With Special Emphasis on Soil and Water
- Working Group D: Soil- and Groundwater-Remediation

The 3rd day was devoted to excursions to two industrial plants (**Sect. 2.5**)

- Visit to Company "ECO" (Koetschach Mauthen, Austria)
- Visit to Company "ETA"(Cerkno, Slovenia)

Finally, on the 4th day a resume and final conclusions were drawn (**Sect. 2.6**)

2.1. Opening Session

2.1.1. Welcome Address

(Herbert SCHILLER, Carinthian Minister of the Environment, Klagenfurt, Austria)

Dear particpant,

For the second time already, Carinthia is hosting an IMPEL-workshop. The first one on the use of alternative fuels in cement plants took place in St.Veit in May 1998 and was very successful. As a result of the workshop, the EU-directive on the co-incineration of waste could effectively be influenced.

Thanks to the financial support of the European Commission, the Austrian Federal Ministry of Environment, Youth and Family Affairs, the Austrian Ministry of Economic Affairs and the Provincial Government of Carinthia we are able to arrange a second IMPEL-workshop.

Our second workshop is dealing with CHCs – substances which are, unfortunately, well-known for several adverse impacts on the environment. There is no new EU-regulation foreseen concerning the use of CHCs at the moment. This workshop should therefore provide answers to the question, if the current regulations are sufficient.

But there is one other, unique aspect of this event: I am very proud that for the first time, so many civil servants from the accession countries are attending an IMPEL-workshop.

We can suppose that the use of and restrictions for CHCs are very differently regulated across all European states. This international workshop should offer the possibility for a wide exchange of experience and give some incentives for future harmonisation.

I am very much hoping that the lovely countryside and friendly population of Carinthia can create the ideal working climate for being creative, communicative and co-operative. The Carinthian environment should offer the preconditions for a successful workshop.

I whish all of you a satisfying workshop and enjoyable days in Carinthia.

Yours sincerely

Herbert Schiller

Carinthian Minister of the Environment

2.1.2.The IMPEL Network

(Karin MIKLAUTSCH, Government of the Province of Carinthia, Dept. 8W, Klagenfurt, Austria)

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an informal Network of the environmental authorities of the Member States of the European Union. The European Commission is also a member of IMPEL and shares the chairmanship of the meetings, and is hosting the Secretariat.

The Network was initiated in 1992. Its objectives are to create the necessary impetus in the European Community to make progress on ensuring a more effective and comparable application of environmental legislation. The Network promotes the exchange of information and experience and the development of a greater consistency of approach in the implementation, application and enforcement of environmental legislation, with a special emphasis an Community environmental legislation. It provides a framework for policy makers and environmental inspectors and enforcement officers to exchange ideas, and encourage the development of enforcement structures and best practices.

Since June 1999 the Network consists of: Plenary Meetings and ad hoc Working or Project Groups for specific topics.

- The **Plenary Meeting** decides on horizontal and strategic issues, approves the work programmes of the working groups, and agrees on the budgets.
- There are several **Working or Project Groups** on specific topics (for example on
  - "Access to Justice",
  - "Changes in Industrial operations/supervision of environmental protection",
  - Application of general binding rules",
  - "Public participation",
  - "TFS",
  - "Comparison project for inspectors",
  - "Project on environmental enforcement practices (PEEP)".

The Network is supported by the **IMPEL Secretariat**, which is hosted by the European Commission. (DG XI. B.3).

2.1.3. Introducing CHC Workshop

(Wolfgang HAFNER, Government of the Province of Carinthia, Dept 15 - Environment, Klagenfurt, Austria)

(1) Why Chlorinated Hydrocarbons (CHC) ?

- CHC are VOC (some of them carcinogenic)
- Implementation of VOC - Directive 1999/13/EC
- reduction of fugitive (diffuse) emissions
- CHC are nonbiodegredable (transfer into soil and groundwater)
- remediation of contaminated sites
- Different state-of-the-art in MS, AC
- workshop is not dealing with CFCs !

(2) Why Industrial Plants ?

- just to limit the frame and to focus the interests
- no dry cleaning
- what is an industrial plant ?
- consumption > 1t per year

(3) Main Objectives

- information
- overview of legal requirements
- comparison among MS, AC
- exchange of experiences
- best practices
- EU-regulation and implementation sufficient ?
- need for EU-wide regulations ?

(4) Milestones

- Approval of TOR by IMPEL, Dec 98
- Approval for co-financing by EC, Jul 99
- 2 Preparatory Meetings, Oct 99 & Feb 00
- Questionnaire
- Workshop, 13th to 16th of March 2000
- Final Report by 31st May 2000

(5) Programme of the Workshop

- Monday, 13th of March
  - background information on scientific, legal, and technical issues
  - overview of MS, AC (results of questionnaire)
  - national case studies
- Tuesday, 14th of March
  - 4 working groups:
  - Group A: ELV in VOC
  - Group B: fugitive Emissions
  - Group C: soil & water pollution prevention
  - Group D: soil & groundwater remediation

- Wednesday, 15th of March
  - site visits to ECO /A and ETA / Slo
- Thursday, 16th of March
  - presentation of results of working groups
  - final discussion
  - resume

(6) Expected Results and Output

- Final report
- recommendations
- lot of experiences
- demonstration for the IMPEL 2000 Conference
- 11th to 13th Oct 2000 Villach, Carinthia

2.2. Main Contributions

2.2.1. Toxicological and Environmental Aspects of CHCs

(Wolfram PARZEFALL, University of Vienna, Institute of Cancer Research, Department of Toxicology, Vienna, Austria)

(1) Toxicokinetics

CHC are of high volatility which largely determines their toxicokinetics. The main route of exposure is inhalation, but in occupational and consumer situations dermal uptake may also contribute to exposure. The second important property of CHC, their lipid solubility, promotes skin penetration: The lipid barrier of the skin is defatted and absorption into the blood stream is facilitated. This may also be a portal for other chemicals possibly dissolved in CHCs. Skin irritation may be a corollary of the removal of the skin lipid barrier. The main route of excretion of most CHC either inhaled or absorbed through skin is exhalation of the unchanged compound. Only a minor part is metabolized in the liver or kidney and excreted in the urine.

(2) Acute Toxicity of CHC

The primary toxic effects of CHC is disturbance of the central nervous system (CNS). Typical symptoms in the order of severity are disorientation, euphoria, giddiness and confusion, progressing to unconsciousness, narcosis, paralysis, convulsion and death from respiratory or cardiovascular arrest. This appears to be a common property of organic solvents of diverse chemical structures and is regarded to be based on physical disturbances of the nerve cells. Also at subanesthetic doses effects on the CNS may be demonstrable. These can be tested for in behavioural studies. The prenarcotic effects were mainly used to derive threshold limit values (TLV) or maximum workplace concentrations (MAK-Werte).

Some CHC show rather specific acute toxic effects in the liver and in the kidney. The toxic potency varies widely between halogenated methanes, ethanes, and halogenated ethenes and chemical structures do not provide a rational for the various effects.

(3) Chronic Toxicity of CHC

Human long-term exposure at elevated doses may lead to liver and kidney damage, neurologic failure, psychical changes, also addiction has been observed (e.g. Trichloroethylene, TCE). Several of the CHCs were placed into the carcinogenic category of the MAK-List (Vinyl chloride (VC), Carc. catg. 1; TCE, Carc. catg. 1; 1,2-Dichloroethane, Carc. Cat. 2; and Perchloroethylene, Carc. Cat. 3) and a MAK value was no longer provided. For the human carcinogens VC and TCE the molecular mechanisms have been elaborated in experimental animals and in humans.

(4) Environmental Effects

Due to their high vapour pressure most CHCs tend to evaporate rapidly into the atmosphere. In particular Dichloroethane, Trichloromethane, Tetrachloromethane, and 1,1,2,2-Tetrachloroethane undergo very slow degradation in the atmosphere and therefore have very long residence times in the troposphere which allows them to travel long distances and to also reach the stratosphere.

CHCs if released on soil are poorly adsorbed, show little or almost no degradation (if known), and are of high mobility. This may lead to rapid leaching to ground water.

CHCs that come into water bodies show rapid evaporation, depending on turbulence. In ground water they may persist for long because degradation is slow in general. It is known for 1,1,2,2-Tetrachloroethane that degardation in the aqueous phase is pH-dependent. The half life was estimated at pH 7, 8, and 9 to be 111, 11, and 1 day(s) respectively.

There is no evidence that the CHCs discussed here have significant potential to bioconcentrate either in aquatic organisms or in the food chain. Relatively low levels of bioconcentration have been observed in fish species for trichloroethen (39x) and tetrachloroethene (49x) at the indicated factors.

There is little data available on the environmental toxicity of the tabulated compounds.

2.2.2. Outline of the IPPC-Directive of the EC

(Hans Erik WOLDENDORP, European Commission, DG ENV, B3 - Legal Unit)

(1) Introduction

My name is Hans Erik Woldendorp. I work as a Dutch national expert in the legal Unit of the Directorate General for the Environment of the European Commission.

Since no officials of the technical unit that is responsible for the Community policy and legislation with regard to VOCs and CHCs could be present here to go more deeply into the relevant community legislation concerning VOCs and CHCs, the Legal Unit of DG ENV was invited to present a general overview of the IPPC Directive to you. However, in our unit we don't have any specialist in the field of VOCs and CHCs.

As will be showed later the IPPC Directive is very relevant to industrial installations that emit VOCs and CHCs. Working for the Dutch Ministry of the Environment I dealt with the transposition of the IPPC Directive into Dutch legislation. Therefore I hope that you will not be too disappointed by my presence here instead of a colleague of the technical unit. By way of compensation I will stay here until tomorrow afternoon to answer general legal questions concerning the application of the environmental Community legislation that you might have.

(2) Subject

I would like to present an overview of the IPPC Directive to you. The official title of this directive is: Council directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control. IPPC = INTEGRATED POLLUTION PREVENTION CONTROL

The IPPC Directive should be transposed by the Member States at the latest on 30 October 1999 (Art 21). At the moment only the following MS have communicated full transposition: Denmark, the Netherlands and Luxembourg. On 18 February 2000 a letter of formal notice has been sent to all the other MS for no communication or partial transposition.

(3) Objective and Scope of the IPPS Directive

The IPPC Directive is to be considered as a key directive in the Community environmental legislation.

OBJECTIVE

The IPPC Directive establishes a general framework for integrated prevention and control of pollution arising from certain categories of activities, in order to achieve a high level of protection for the environment taken as a whole (Art 1).

The distinction with many other directives is the integrated approach. The IPPC Directives concerns emissions of polluting substances into the air, water and land. The IPPC Directive aims at prevention of shifting of pollutions between air, water and land by protecting the environment as a whole.

The IPPC Directive is an example of horizontal legislation that is not limited to only one medium. Other examples: Directive 85/337/EEC (environmental impact assessment); Directive 82/501/EEC (Seveso Directive); Directive 90/313/EEC (access to information).

SCOPE

On the one hand the scope of the IPPC Directive is limited to the categories of industrial activities referred to in Article 1 and listed in Annex I (called installations within the meaning of the IPPC Directive).

The IPPC Directive only applies to stationary installations whose potential for pollution, included transfrontier pollution, is significant.

Annex I includes a wide range of industrial activities which are grouped into 6 categories:

- energy industries
- production and processing of metals
- mineral industry

- chemical industry
- waste managament
- other activities

For most activities capacity thresholds are set to determine which installations are covered.

On the other hand, the scope of the IPPC Directive is broad with respect to the environmental effects (Art 2,2 and Art 3).

- pollution: the direct or indirect introduction of substances, vibrations, heat or noise into the air, water or land which may be harmful to human health or the quality of the environment or (…) can result in damage to material properties
- production, recovery and disposal of waste
- efficient energy use
- the preventing of accidents and limiting of their consequences
- pollution risk and the return of the site of operation to a satisfactory state in case of definitive cessation of activities

(4) Basic Instrument

The basic instrument in the IPPC Directive is the requirement of a permit/authorisation for the activities that fall within the scope of the IPPC Directive (art 4 and Art 5).

DEFINITION OF PERMIT

Definition of permit: part or the whole of a written decision (or several such decisions) by which the competent authority grants authorisation to operate all or part of the installation.

This implies that the IPPC Directive does not require that only one decision shall be taken neither that only one competent authority is involved. Essential is that an integrated approach of the installation and the environmental effects that it can have, is guaranteed. All the decisions with respect to the authorisation of the installation have to be considered together.

Therefore Art 7 requires that the competent authority or competent authorities shall fully co-ordinate the conditions of, and procedures for the grant of, the permit, in order to guarantee an effective integrated approach by all competent authorities for these procedures.

The competent authority is appointed by the Member State in order to carry out the obligations arising under the IPPC Directive (Art 2,8).

According to Art 8 the permit shall contain conditions guaranteeing that the installation complies with the requirements of the IPPC Directive.

NEW INSTALLATIONS AND EXISTING INSTALLATIONS

A permit is not only required for new installations, but also for existing installations and for substantial modifications in the operation of existing installations (Art 12).

NEW INSTALLATIONS

Pursuant to Art 4

- new installations and
- substantial modifications of existing installations

have to comply with the IPPC Directive from 30 October 1999.

EXISTING INSTALLATIONS

Pursuant to Art 5 of the IPPC Directive existing installations (defined in Art 2,4) have to comply with the IPPC Directive from 30 October 2007.

From this provision can be concluded that for existing installations a permit is required too. So the operators of such an installation has to apply for a permit in time so that the competent authority can grant the permit before 30 October 2007. If a permit has already been granted, the competent authority shall reconsider whether the conditions should be updated in order to bring the permit in accordance with the IPPC Directive.

In fact the date 30 October 2007 only applies to the following provisions:

- Art 3 (general principles governing the basis obligations of the operator)
- Art 7 (integrated approach to issuing permits)

- Art 9 (conditions of the permits)
- Art 10 (best available techniques and environmental quality standards)
- Art 13 (reconsidering and updating of permit conditions by the competent authority)
- Art 14, first and second indents (compliance with permit conditions)
- Art 15(2) (access to information and public participation in the permit procedure)

However, these provisions contain the obligations which the operator has to fulfil.

The following provisions apply from 30 October 1999:

- Art 1 (purpose and scope)
- Art 2 (definitions)
- Art 11 (developments in best available techniques)
- Art 14, third indent (compliance with permit conditions: operator assists representatives of the competent authority)
- Art 15(1)(2)(3) (access to information and public participation in the permit procedure)
- Art 16 (exchange of information concerning best available techniques - BATs - and emission limit values - ELVs)
- Art 17 (transboundary effects)
- Art 18 (Community ELVs)

The most of these provisions don't address to the operator of the installation. In any case, the provisions don't contain the basic obligations for the operator.

Addressee of the requirement of a permit for an installation is the operator of the installation.

PERMIT FOR SUBSTANTIAL CHANGES IN THE OPERATION OF AN EXISTING INSTALLATION

Art 12 of the IPPC Directive.

In addition, the competent authority shall periodically reconsider and, where necessary, update permit conditions, in particular as a result of:

- revision of existing ELVs
- inclusion of new ELVs
- substantial changes in the BATs that make it possible to reduce emissions significantly without imposing excessive costs
- new provisions of EC legislation or national legislation

DEFINITION OF INSTALLATION

Art 2(3) gives the following definition of installation:

A stationary technical unit where one or more activities listed in Annex I are carried out, and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an effect on emissions and pollution.

directly associated activities which have a technical connection

The definition of installation is restricted to units here Annex I activities are carried out, and not to other operations on the site.

'directly associated activities': the purpose hereof is to extend the definition and therefore scope of the directive to include some non-Annex I activities

- carried out by the same operator and on the same site as an Annex I activity
- and the way in which they are carried out has some technical implication for the way in which the Annex I activity should be carried out in order to reduce the impact on the environment as a whole.

In my opinion it would have no sense to take into account only the parts of an installation that are explicitly mentioned in Annex I. That would be contrary to the integrated approach of the installation and its environmental effects that is characteristic of the IPPC Directive.

DEFINITION OF OPERATOR

The definition can be found in Art 2,12:

Any natural or legal person who operates or controls the installation (…)

In my opinion the crucial point is that the operator has it practically in its power to fulfil the obligations arising from the IPPC Directive.

BASIC OBLIGATIONS FOR THE OPERATOR

Art 3 describes the obligations for the operator.

The basic obligation for the operator is to take all appropriate preventive measures against pollution, in particular through the application of the best available techniques (BAT). The meaning of BAT will be discussed hereafter.

Other obligations are:

- no significant pollution shall be caused
- waste production shall be avoided; where waste is produced, it shall be recovered or, where that is technically and economically impossible, it shall be disposed of while avoiding or reducing any impact on the environment
- energy shall be used efficiently
- the necessary measures shall be taken to prevent accidents and limit their consequences
- necessary measures shall be taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state

Article 9(5) contains obligations for the competent authority which are the mirror image of the obligations for the operator.

Pursuant to Article 9(5) the (conditions of the) permit shall include:

- limit values for pollutants, in particular those listed in Annex III, likely to be emitted from the installation in significant quantities (integrated approach with regard to all mediums)
- suitable release monitoring requirements (specifying measurement methodology and frequency, evaluation procedure, obligation to supply the competent authority with data required for compliance with the permit)
- (in all circumstances) provisions on the minimization of long-distance pollution (there can be referred to Art 17, transboundary effects)
- measuring relating to conditions other than normal operating (and may contain temporary derogations)

and ensure a high level of protection for the environment as a whole.

These provisions illustrate that the IPPC approach is addressed to both the operator of an installation as the regulator / competent authority for the granting of the permit on behalf of an installation.

IPPC approach = integrated look at the installation and all its environmental impacts, on the basis of the best available techniques.

GENERAL BINDING RULES

A Member State may prescribe requirements for certain categories of installations by general binding rules instead of including those requirements in individual permit conditons (provided that an integrated approach and an equivlent high level of environmental protection as a whole are ensured).

However, these general binding rules can only replace permit conditions but not the requirement of the permit as such. For an installation that falls under the IPPC Directive an individual permit is always required.

APPLICATION OF PERMITS

In accordance with Art 6 an application to the competent authorities for a permit shall include a description of:

- the installation and its activities
- the raw and auxiliary materials, other substances and the energy used in or generated by the installation
- the nature and quantity of the emissions from the installation into each medium
- identification of significant effects of the emissions on the environment
- the proposed technology and other techniques for preventing or reducing emissions from the installation
- measures for the prevention and recovery of waste generated by the installation

- further measures planned to comply with the general principles of the basic obligation of the operator pursuant to Art 3
- measures for monitoring emissions into the environment
- non-technical summary

(5) Definition of Best Available Techniques (BAT)

As said before the main obligation for the operator is to take all appropriate preventive measures against pollution, in particular through the application of the best available techniques (BAT).

A definition of BAT and its main elements can be found in Art 2(11).

BAT = the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values (ELVs) designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.

Techniques includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

Available techniques means: those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the MS in question, as long as they are reasonably accessible to the operator.

BATs have to be considered on Community or even world level rather than on MS level.

From the definition of available follows that the costs of the techniques that have to be applied in accordance to BAT have to be taken into consideration, however, not on the level of the individual installation but on the level of the relevant industrial sector.

In my opinion BAT means: economically and technically feasible. On this point I speak in a personal capacity. Concerning the definition and exact contents of BATs exists much confusion. In practice many of the different views might come down to the same thing.

An increasing number of studies suggest that competitiveness and environmental performance go hand in hand. What is feasible for the average installation should be realised by each installation.

The development and exchange of information at Community level about BAT will help to redress the technical imbalances in the Community.

Best means: most effective in achieving a high general level of protection of the environment as a whole.

All the different types of environmental impacts that an installation could have shall be considered.

In determining the best available techniques special consideration should be given to the items listed in Annex IV.

The IPPC-approach requires that both operators and permitting authorities are aware of the BATs in the relevant industrial sector.

Art 11 of the IPPC Directive requires that the competent authority shall follow or is informed of developments in BATs.

Art 16(2) requires that the Commission organises an exchange of information between MS and the industries on BATs (BAT information exchange)

The IPPC Directive does not specify what form of BAT information exchange should take place or how the Commission should organise it. It only specifies that the Commission must publish the results of the exchanges of information every three years. These published results must be taken into account when the BAT is determined generally or in specific cases (Annex IV). I refer to this very interesting and important annex.

Best Available Technique (BAT) Reference Documents (BREFs) give a description.

The publication of more that 30 BREFs is envisaged covering all industrial sectors covered by the Directive, as well as some horizontal subjects.

BREFs are drafted by the European IPPC Bureau (EIPPCB), within the Institute of Prospective Technological Studies (IPTS) in Seville.

The Commission should publish the results of the exchange of information (adopted by the Commission as a Communication or a Decision).

(6) Definition of Emission Limit Values (ELV)

It should be noted that there is a difference between best available techniques (BATS) and emission limit value (ELVs).

ELVs are binding for the competent authority and the operator of an installation (Art 2,6).

ELVs indicate the mass, concentration and/or level of an emission, which may not be exceeded during one or more periods or time.

ELVs may also be laid down for certain groups, families or categories of substances, in particular for those listed in Annex III.

ELVs shall be based on the BATS (best available technique), without prescribing the use of any technique or specific technology.

Interesting in this respect is Article18 of the IPPC Directive concerning Community emission limit values (C-ELVs).

This provision says that the Council, acting on a proposal of the Commission, will set ELVs for:

- the categories of installations listed in Annex I
- the polluting substances referred to in Annex III

for which the need for Community action has been identified, on the basis of the exchange of information provided for in Art 16.

In the absence of C-ELVs the relevant ELVs contained in the directives referred to in Annex II and in other Community legislation shall be applied as minimum emission values pursuant to the IPPC Directive for the installations listed in Annex I.

The ELVs remain in force as long as they are not superseded by legislation adopted pursuant the IPPC Directive. More stringent conditions must be set if required by the other IPPC provisions (in particular those relating to BAT and EQS'). Thus the ELVs are to be considered as a minimum standards.

The ELVs should be distinguished from environmental quality standard (EQS'): the set of requirements which must be fulfilled at a given time by a given environment or particular part thereof (Art 2,7).

The ELV concerns the emission (source), the EQS the environment (effect).

(7) Control and Enforcement

Pursuant to Art 14 the competent authority shall ensure that;

- the conditions of the permit are complied with by the operator when operating the installation
- it will be regularly informed by the operator regularly of the monitoring of releases and of any accident
- the operator of the installation will afford its representatives all necessary assistance to enable them to carry out inspections within the installation, to take samples and to gather any information necessary for the performance of their duties for the purposes of the IPPC Directive.

This provision is of course especially interesting within the frame of IMPEL.

(8) Access and Information

According to Art 15 access of information shall be guaranteed (about the appilcation for a permit for a new installation and for a substantial change of an existing installation, the permit and the results of monitoring of the emissions and sources) as well as public participation (according to Art 17 also in other MS).

There can also be referred to Directive 90/313 on the freedom of access to information on the environment.

(9) The IPPC Directive and VOCs

Relevant directive:

Council directive 1999/13 of 11 March 1999 on the limitation of emissions of volatile organic compounds (VOCs) due to the use of organic solvents in certain activities and installations

Date of implementation: April 2001

Objective of D 99/13

Art 1

Prevention and reduction of (air pollution) direct and indirect effects of emissions of VOC into the environment (mainly into the air) and the potential risks to human health.

VOC = volatile organic compound; Art 2(17)

High level of public health and environmental protection. Envisaged is a reduction of the emissions of VOC (taking into account the likely growth of the sector) with 57%.

This objective falls within the scope of the IPPC Directive.

SCOPE

The VOC Directive concerns:

- activities mentioned in Annex I (various industrial sectors)
- in so far as they operate above the solvent consumption thresholds listed in Annex IIA.

These industrial activities are believed to be the principle European organic solvent emission sources and the pollution caused in one MS often influences the air and water of other MS.

However, there are other important sources of the emission of VOCs, i.e. traffic (mobile sources: 45% of the total of emissions of VOCs), petrochemical companies, car manufacturers, and agricultural products. Those sources fall (partially) under other directives.

The VOC Directive concerns stationary sources (solvent use), 30% of the total of VOC emissions. 58% of the solvent use is industrial use (about 400.000 companies in the EU), 42 is domestic use. Paint application accounts for 38% of the emissions from industrial organic solvents use in the EU.

The VOC Directive deals with transboundary effects, thus of special interest within the scope of the IPPC Directive.

Organic solvents are used by many different types take place in many installations and activities (large, medium and small sized). Large sized installations and activities fall under the scope of the IPPC Directive.

Installations falling under the scope of that directive are under no circumstances exempted from the IPPC Directive.

An installation is a unit where one or more activities defined in Annex I are carried out.

BASIC INSTRUMENT

The VOCs Directive divides the categories of activities that fall within its scope and assigns emission limit values to individual installations that are believed to be economically and technically feasible.

Distinction is made between:

- new installations
- existing installations

Existing installations shall comply with the emission limit values (ELVs)before 31 October 2007 (same timetable for compliance as the IPPC Directive)

For the installations a permit should be given or they must be registered.

WAYS FOR THE REDUCTION OF EMISSIONS OF VOCs

- potentially less harmful substitutes are available or will become available within the coming years; use of low-solvent or solvent-free products and techniques
- if substitutes are not available: other technical measures should be taken to reduce emissions into the environment as much as economically and technically feasible (an assessment was made of the technically feasible reductions for each sector; these technologies were costed in order to identify unacceptable measures)
- the use of organic solvents and the emissions of organic compounds which have the most serious effects on public health should be reduced as much as technically feasible

(10) Interesting for IMPEL

NON-COMPLIANCE

Article 10 says:

MS shall take appropriate measures to ensure tat in case of a breach of the requirements of the VOCs Directive:

- operator informs the competent authority and takes measues to ensure compliance
- (…)

SANCTIONS

Article 14 says:

MS shall:

- Determine sanctions applicable to breaches of the national provisions (sanctions must be: effective, proportionate and dissuasive)
- Take all measures for their implementation

CONCLUSION

For general legal questions concerning (the application of) Community law you can reach me under:

- Tel. 00 32 2 2961794
- Fax 00 32 2 2991070

2.2.3. Legislative Background from EC-IPPC, VOC, Water Directives and Other Relevant Community Legislation

(Ilse SCHINDLER, Austrian Federal Environmental Agency, Vienna, Austria)

(1) Abstract

The Production and use of Hydrocarbons, including chlorinated hydrocarbons, are subject to all fields of European Regulation and Legislation. This presentation gives an overview about the different approaches that are:

- Health and Safety
- Classification, Packaging and Labelling, (Directives 67/548/EEC and 93/72/EEC)
- Marketing (Restrictions for dangerous substances, Directive 76/769/EEC, last Amendment 99/77/EC
- Reduction at source from industrial installations and products
- European Framework concerning Water and Air Quality

The focus of the presentation is on the directives

- **99/13EC** (on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations)
- **96/61/EC** on Integrated Pollution Prevention and Control
- **76/464/EEC** on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community and its daughter directives (86/280/EEC, 88/347/EEC, 90/414/EEC, 84/891/EEC)

Additional information, mainly in context with the directives mentioned above, is provided on the

- The Proposal for a water framework directive, list of Priority substances
- Legislation in the field of health and safety, Classification, Packaging and Labelling, Marketing

(2) Legislative Background from the European Community

- Health and Safety Chlorine and its compounds C 168 from 25/07/75
- Classification, Packaging and Labelling (67/548EEC, 93/72/EC)
- Marketing (Restrictions for dangerous Substances 76/769/EEC)
- Emission from industrial processes 96/61/EC, 99/13/EC
- Emission / Immission into Air and Water 96/62/EC, 76/464/EEC

(3) Classification, Packaging and Labelling (CPL)

- Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances
- Council Directive 93/72/EC adapting to technical progress for the nineteenth time 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances

Substances	classification	labelling R = special risk phrases S = safety advices	Index- EWG- number CAS-
dichloromethane	harmful Xn	R 40 S (2)-23-24/25-36/37	6002-004-003 200-838-9 75-09-2
1,1,1-trichloroethane	harmful Xn, environmentally dangerous N	R20, 59 S (2)-24/25-59-61	602-013-00-2 200-756-3 71-55-6

trichloroethylene	harmful Xn, cancerogen cat. 3	R 40 S (2)-23-36/37	602-027-00-9 201-167-4 79-01-6
tetrachloroethylene	harmful Xn, cancerogen cat. 3	R 40 S (2) 23-36/37	602-028-00-4 204-825-9 127-18-4
tetrachloromethane	toxic T, environmentally dangerous N	R 23/24/25-40-48/23-59 S (1/2)) 23-36/37-45-59-61	602-008-00-5 200-262-8 56-23-5

(4) IPPC Integrated Pollution Prevention and Control 96/61/EC

(4.1) Art. 1 Purpose and Scope

- The purpose of this directive is to achieve integrated prevention and pollution control from activities listed in Annex I
- It lays down measures designed to prevent or, where that is not practicable, to reduce emissions into air, water and land from the above mentioned activities, including measures concerning waste
- In order to achieve a high level of protection of the environment taken as a whole
- without prejudice to directive 85/337/EC and other relevant Comm. P.

(4.2.) Art. 3 Basic Obligations of the Operator

Member States / Competent Authorities shall ensure that installations are operated in such a way that

- all the appropriate preventive measures are taken against pollution, in particular through application of best available techniques
- no significant pollution is caused
- waste production is avoided in accordance with CD 75/442/EEC...
- energy is used efficiently
- necessary measures are taken to prevent accidents / limit their consequences
- necessary measures are taken upon definitive cessation......

(4.3.) Art. 9 Conditions of the Permit

- Permit shall include all measures necessary for compliance with the requirements of Art. 3 and 10 for granting of permits
- The permit shall include emission limit values for pollutants, especially those listed in Annex III,....., having regard to their nature......ensuring protection of soil and ground water........waste management...... Where appropriate, limit values may be supplemented or replaced by equivalent parameters or technical measures.
- The permit shall contain suitable release monitoring requirements,........Supply the competent authority with data for checking compliance with permit
- Member States may prescribe certain requirements for certain installations in general binding rules ..... Ensuring integrated approach and envir. protection

(4.4.) Art. 18 Community Emission Limit Values

1. Acting on a proposal from the Commission, the Council will set ELVs, in accordance with the procedure of the Treaty for

- categories of installations listed in Annex I except 5.1 and 5.4 (landfills)
- the polluting substances referred to in Annex III

for which the need for Community action has been identified on the basis of Art. 16, especially Art. 16 (2)

2. In absence of Community ELVs defined pursuant to this directive, the relevant ELVs contained in other Community Legislation shall be applied as a minimum ELVs for installations of Annex I

(4.5) IPPC 96/61/EC Annex I

1. Energy Industries

2. Production and Processing of Metals

2.6 Installations for Surface treatment of metals and plastic materials using an electrolytic or chemical process, volume of treatment vat ⊛ $30m^3$

3. Mineral Industry

4. Chemical Industry (Production of CHCs, basic plant health products, biocides, basic pharmaceuticals products)

5. Waste Management

6. Other Activities

6.7 Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, de-greasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150kg per hour or more than 200t/year

(4.6.) IPPC 96/61/EC Annex III

Indicative list of the main polluting substances to be taken into account if they are relevant for fixing emission limit values for air and water

- Volatile Organic Compounds (air)
- Chlorine and its compounds (air)
- Substances and preparations which have been proved to process carcinogenic or mutagenic properties or properties which may affect reproduction via the air (air and water)
- Polychlorinated dibenzodioxines and polychlorinated dibenzofuranes (air)
- Biocides and plant health products (water)
- Organohalogen compounds and substances which may form such compounds in the aquatic environment (water)

(4.7.) IPPC 96/61/EC Annex IV

Consideration to be taken into account for determination of BAT, bearing in mind the likely costs and benefits and the principles of prevention and precaution

- the use of low waste technology
- the use of less hazardous substances
- recovery and recycling of substances generated and used in the process
- comparable processes, facilities or methods of operation which have been tried with success on an industrial scale
- technological advances and changes in scientific knowledge and understanding
- nature, effects and volume of the emission concerned
- commissioning date, time to introduce BAT, consumption of nature, materials energy
- the need to prevent or reduce to a minimum overall impact of emissions + risks
- the need to prevent accidents and to minimise the consequences for environment
- the information published by the EC or international organisations

(5) VOC Directive 99/13/EC of 11 March 1999

on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations

Considerations of the Council of the European Union - Präamble

- Having regard to the Treaty, in particular Art. 130s(1) thereof
- Resolution of 19 October 1987 emphasis the importance of Community action to concentrate,i.a., on implementation of appropriate standards in order to ensure a high level of public health and environment protection
- EC and MS are parties to the Protocol to the 1979 Convention on Longe Range Transboundary Pollutants

- Pollution of VOC influences Air and Water of other MS, whereas in accordance with Treaty Art. 130r action at Community level is necessary

(5.1) Article 1 Purpose and Scope

- The purpose of this directive is to prevent or reduce the direct and indirect effects of emissions of VOCs into the environment, mainly into air, and the potential risks to human health
- by providing measures and procedures to be implemented for the activities defined in Annex I in so far
- as they are operated above the solvent consumption treshhold list Annex IIA

(5.2.) Article 2 Definitions

(5.3.) Article 3 Obligations applying to new installations

MS shall adopt all the necessary measures to ensure that

- All new installations comply with Art. 5, 8 and 9
- All new installations not covered by IPPC (96/61/EC) are registered or undergo authorisation before being put into operation

(5.4.) Article 4 Obligations applying to existing installations

- comply with Art. 5, 8 and 9 no later than 31. Oct. 2007 (same as IPPC)
- registration or authorisation by 31. Oct. 2007 at the latest
- For installations authorised or registered using the reduction scheme of Annex IIIB notify this to competent authorities by 31 October 2005 latest
- substantial change / enter the scope of VOC directive

(5.5.) Article 5 Requirements

1. MS shall take the appropriate measures either in the specification of the conditions for authorisation or by general binding rules to ensure that §§ 2 to 12 are complied with

2. All installations shall comply with
(a) either the emission limit values in waste gases and the fugitive emission values or the total ELVs and other requirements laid down in Annex IIA
(b) the requirements of the reduction scheme specified in Annex IIB

6. Substances or preparations which, because of their content of VOCs, classified as carcinogens, mutagens or toxic to the reproduction under 67/548/EEC (10) are assigned or need to carry the risk phrases R 45, R46, R49, R60, R61, shall be replaced , as far as possible ..(ref. To Art. 7) .... by less harmful substances within the shortest possible time

7. For discharge of VOCs referred to in § 6, where the mass flow of the sum of compounds (labelling § 6) is ⇩ 10g/h an ELV of 2 mg/Nm^3 shall be complied with. ELV refers to mass sum of individual compounds

8. For discharge of chlorinated VOCs which are assigned the risk phrase R40,
where the mass flow of the sum of compounds (labelling R40) is ⇩ 100g/h an ELV of 20 mg/Nm^3 shall be complied with. ELV refers to mass sum of i. comp.

The discharge of VOCs referred to in paragraphs 6 and 8 shall be controlled as emissions from an installation under contained conditions as far as technically and economically feasible to safeguard public health and the environment

9. Compliance for VOCs labelling as §§6, 8 with ELVs mentioned in §§ 7, 8 within the shortest possible time

12 . No exemptions (neither by reduction scheme nor § 11 or Art. 6) for installations discharging this VOCs from requirements of those §§6, 7 and 8

(5.6.) Article 6 National plans

- MS may define and implement National Plans for reducing emissions from activities and industrial installations covered by Art. 1, excluding activities 4 and 11 of Annex IIA.
- These plans shall result in a reduction of the annual emission equal to limits under Art. 5(2) and (3) and Annex II
- The national plan will be resubmitted to the Commission every three years

- No exemptions for plants under the IPPC Directive

(5.7.) Article 7 Substitution

- The Commission shall ensure that an information exchange between MS and the activities concerned on the use of organic substances and their potential substitutes takes place.

(5.8.) Article 8 Monitoring

- MS shall introduce an obligation for the operator .... to supply the competent authority once a year or on request with data that enables the competent authority to verify compliance with this directive
- Continuous monitoring after abatement equipment for emissions ⇩ 10kg/h
- In other cases continuous or periodic (3 readings obtained) measurements
- Information Exchange on the use of solvent management plans

(5.9.) Article 9 Compliance with ELVs

(5.10.) Article 10 Non Compliance

(5.11.) Article 11 Information Systems and Reporting

(5.12.) Article 12 Public Access to Information

(5.13) Article 13 Committee

(5.14.) Article 14 Sanctions

(5.15.) Article 15 Transpositions

MS shall bring into force laws, regulations and administrative provisions necessary to comply with this directive no later than .... April 2001

Austrian Legislation

- Ordinance 872/95 on the prohibition and limitation of organic solvents
- Ordinance 855/94 on the limitation of chlorinated organic solcents due to the use of organic solvents in certain industrial installations (coating)

(5.16.) Article 16 Entry into force

(5.17.) Article 17 Addresses

(5.18.) VOC Directive 99/13/EC Annex I

This Annex contains the categories of activities referred to in Article 1.

When operated above the tresholds listed in Annex IIA, the activities mentioned in this Annex fall within the scope of the Directive.

In each case the activity includes the cleaning of the equipment but not the cleaning of products unless specified otherwise.

- Adhesive coating (except associated with printing activities)
- Coating activity - a single or multible application of a continuous film of acoating is applied to: all kinds of vehicles, metallic and plastic surfaces, wooden surfaces, textile, film and paper surfaces, leather
- Coil coating - any activity where coiled steel, stainless steal, coated steel, copper alloys or aluminium strip is coated with either a film forming or laminate coating in a continuous process
- Dry Cleaning - Any industrial or commercial activity using VOCs in an installation to clean garments, furnishing and similar consumer goods (exception for manual removal of stains/spots in textile/ clothing industry)
- Footwear manufacture
- Manufacturing of coating preparations, varnishes, inks and adhesives
- Manufacturing of pharmaceutical products - by chemical synthesis, fermentation, extraction, formulation and finishing (also intermediates at the same site)

- Printing
- Rubber Conversion, Surface cleaning
- Vegetable oil and animal fat extraction, vegetable oil refining
- Vehicle refinishing, Winding wire coating
- Wood impregnation, Wood and plastic lamination

(6) VOC Directive 99/13/EC Annexes

(6.1.) Annex I Scope

(6.2.) Annex IIA Thresholds and Emission Controls

Industrial sector Annex IIA (threshold for the solvent consumption in tonnes/year)	Threshold solvent consumption tonnes / year	Emission limit for waste gas mg C/Nm³	Fugitive emission limit new / exist.		Total emission limit new / exist.	
Surface cleaning (> 1)	1 – 5 > 5	20 20	15 % of solvent input 10 % of solvent input			
vegetable oil and animal fat extraction (> 10)					animal fat: 1,5kg/t Rizinus: 3,0kg/t rapeseed: 1,0kg/t sun flower seed: 1,0kg/t soybean: 0,8 esp.. 1,2kg/t	
Winding wire coating (> 5)					10g/kg	5g/kg
manufacturing of coating prepara-tions, adhesives and solvents (> 100)	100-1000 > 1000	150 150	5 % of solvent input 3 % of solvent input		5% for applied solvents 3% for applied solvents	
manufacturing of pharmaceutical products (> 50)		20	5 %	15 %	5% / 15% for applied solvents	
vehicle coating (< 15)	> 0,5	50	25 % of solvent input			
printing 1) headset- (> 15) 2) Illustrations (> 25)	15-25 > 25	100 20 75	30 % of solvent input 30 % of solvent input 10 % / 15 %			
adhesive coating (> 5)	5-15 > 15	50 50	25 % of solvent input 20 % of solvent input			
Dry cleaning					20g/kg	

(6.3.) Annex IIB Reduction Scheme

purpose is to allow the operator the possibility to achieve by other means emission reduction, equivalent to those achieved via applying ELVs

Period of time		Total emission limit
new installations	existing installations	
until 31.10.2001	until 31.10.2005	target emission x 1,5
until 31.10.2004	until 31.10.2007	target emission

(6.4.) Annex III Solvent Management Plan

Provides guidance on carrying out a solvent management plan

- Identifies the Principles to be applied (reference to Art. 9)
- provides framework for the mass balance
- indicates requirements for verification of compliance

(7.) Emission and Immission - Quality of Air and Water

- Directive 96/62/EC on ambient air quality assessment and management

- Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community and its daughter directives
- 86/280/EEC on limit values and quality objectives for discharges of certain dangerous substances included in List I of Annex I of the Directive 74/464/EEC (Carbon Tetrachloride, DDT, Pentachlorophenol PCP)
- 88/347/EEC amending Annex II to Directive 86/280/EEC on limit values and quality objectives for discharges included in List 1 of the Annex to directive 76/464/EEC (Aldrin, Dieldrin, Endrin, Isodrin)
- 90/415/EEC amending Annex II to Directive 86/280/EEC on limit values and quality objectives for discharges included in List 1 of the Annex to directive 76/464/EEC (1,2 Dichlorethan ECD, Trichloroethylene TRI, Perchloroethylene PER, Trichlorobenzene TCB)
- 84/891/EEC Council directive on limit values and quality objectives for discharges of hexachlorcyclohexane
- Directive 80/464/EEC on the protection of groundwater against pollution caused by certain dangerous substances

(8.) Emission and Immission - Quality Water

- Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community and ist daughter directives

Type of industrial plant	**Type of average value**	**Limit value expressed as**		**To be complied since**
		Weight	Concentration in effluent µg/l of water discharged	
Production of aldrin and/or dieldrin and/or endrin including formulation of these substances on the same site	Monthly	3 g per tonne of total production capacity (g/t)	2	1.1.1989
	Daily	15 g per tonne of total production capacity (g/t)	10	1.1.1989

Environmental Quality Standards	**Substance**	**Quality objectives**	**To be complied since**
- Inland surface waters	Aldrin	10 ng/l	
- Estuary waters	Dieldrin	10 ng/l	1.1.1994
- Internal coastal waters other than estuary waters	Endrin	5 ng/l	
- Territorial sea waters	Isodrin	5 ng/l	

Type of industrial plant	**Type of average value**	**Limit value expressed as**		**To be complied since**
		Weight (g/t)	Concentration (mg/l)	
Trichloroethylene (TRI) and perchloroethylene (PER) production	Monthly	2,5	0,5	1.1.1995
	Daily	5	1	1.1.1995

Use of TRI for degreasing metals	Monthly	-	0,1	1.1.1993
	Daily	-	0,2	1.1.1993

Environmental Quality Standards	**Substance**	**Quality objectives**	**To be complied since**
- Inland surface waters	TRI		
- Estuary waters	PER	all	
- Internal coastal waters other than estuary waters	1,2 Dichloro-	10 µg/l	1.1.1993
- Territorial sea waters	ethan		

Water Framework Directive - Amended Proposal for a European Parliament and Council Directive establishing a framework for Community action in the field of water policy (Version 30.7.99, Brussels)

Art. 1 Purpose is to establish a framework for the protection of inland surface water, transitional water, coastal waters and ground waters which

- prevents further deterioration and protects and enhances the status of aquatic ecosystems.....
- Promotes sustainable water use based on a long-term protection of available water resources
- contributes to mitigating the effects of floods and droughts
- and thereby contributes to
- sufficient supply of good quality surface water and ground water
- the protection of territorial and marine waters
- achieving the objectives of international agreements, including marine environment
- the progressive reduction of emissions of hazardous substances

(9.) Water Framework Directive - Amended Proposal - Overview

- River Basin Management Plan
- River Basin Districts Review of environmental impact of human activity and economic analysis of water use
- Register of Protected Areas (established by Member States)
- Water used for the abstraction of drinking water MS shall ensure that resulting water will meet the requirements of directive 80/778/EC as amended by directive 98/83/EC
- Combined Approach for point and diffuse sources. Relevant discharges are subject to control according to Art. 10 Emission Control based on BAT or relevant emission limit values in case of diffuse impact Best Environmental Practices at the latest 13 years after directive into force, unless specified otherwise in other legislation
- Where quality standards require stricter condition than result from application of art. 2, more stringent emission controls shall be set accordingly
- Strategies against pollution of water (Art. 16) Priority list of substances, risk assessment
- Repeals and Transitional provisions (7 resp. 13 years after entry into force)

(9.1.) Priority organic micropollutants (monitoring-based list)

1. PAHs
2. Pentachlorophenol
3. Heptachlor
4. Chlorpyifos
5. Hexachlorobenzene
6. Monochloronitrobenzenes
7. Tichlorobenzenes
8. Chlorfenviphos

14. Isoproturon
15. Endosulfan
16. Alachlor
17. Hexachlorobutadiene
18. HCHs
19. Atrazine
20. Simazine
21. Chloroalkanes, C 10-13

9. Diuron
10. Trifluralin
11. Trichloromethane
12. Dichloromethane
13. 1,2-Dichloroethane
22. Benzene
23. Nitrobenzene
24. Di(2-ethylhexyl)phthalate (DEHP)
25. Octylphenols-Nonylphenols

(18.) Acknowledgements to:

- Organisers of the Workshop: W. Hafner, S. Eberhartinger, W. Muchitsch
- Water Department of UBA, Dr. Vogel and A. Scheidleder
- Mag. Georg Rebernig

2.2.4. History and Development of CHCs

(Guenter DUSSING, Provincial Government of Salzburg, Austria)

(1) Systematic and important substances of Chlorinated Hydrocarbons

Chloromethanes	• Trichloromethane • Tetrachloromethane
Chloroethane	• 1,1,1-Trichloroethane
Chloroethylenes	• Vinyl Chloride • Trichloroethylene • Tetrachloroethylene
Chloropropanes, Chlorobutanes	
Chlorinated paraffines	
Nucleus chlorinated aromatic hydrocarbons	• Hexachlorobenzene • Chlorinated Biphenyls
Side chain chlorinated hydrocarbons	
Chloro-Phenols	• Pentachlorophenol
Organochlorine Insecticides	• DDT • Hexachlorocyclohexane

(2) Characteristics of CHC (C1 and C2)

Common characteristics

- low solubility in water
- high solubility in most organic solvents
- volatility with water vapor
- form azeotropic mixtures

Characteristics depending on the chlorine substitution

- inflammability
- solubility
- stability (in the absence of light and temperature)

Uses of CHC in industry

- cleaning
- degreasing
- extraction
- solvent
- aerosol
- intermediate in the chemical industrie

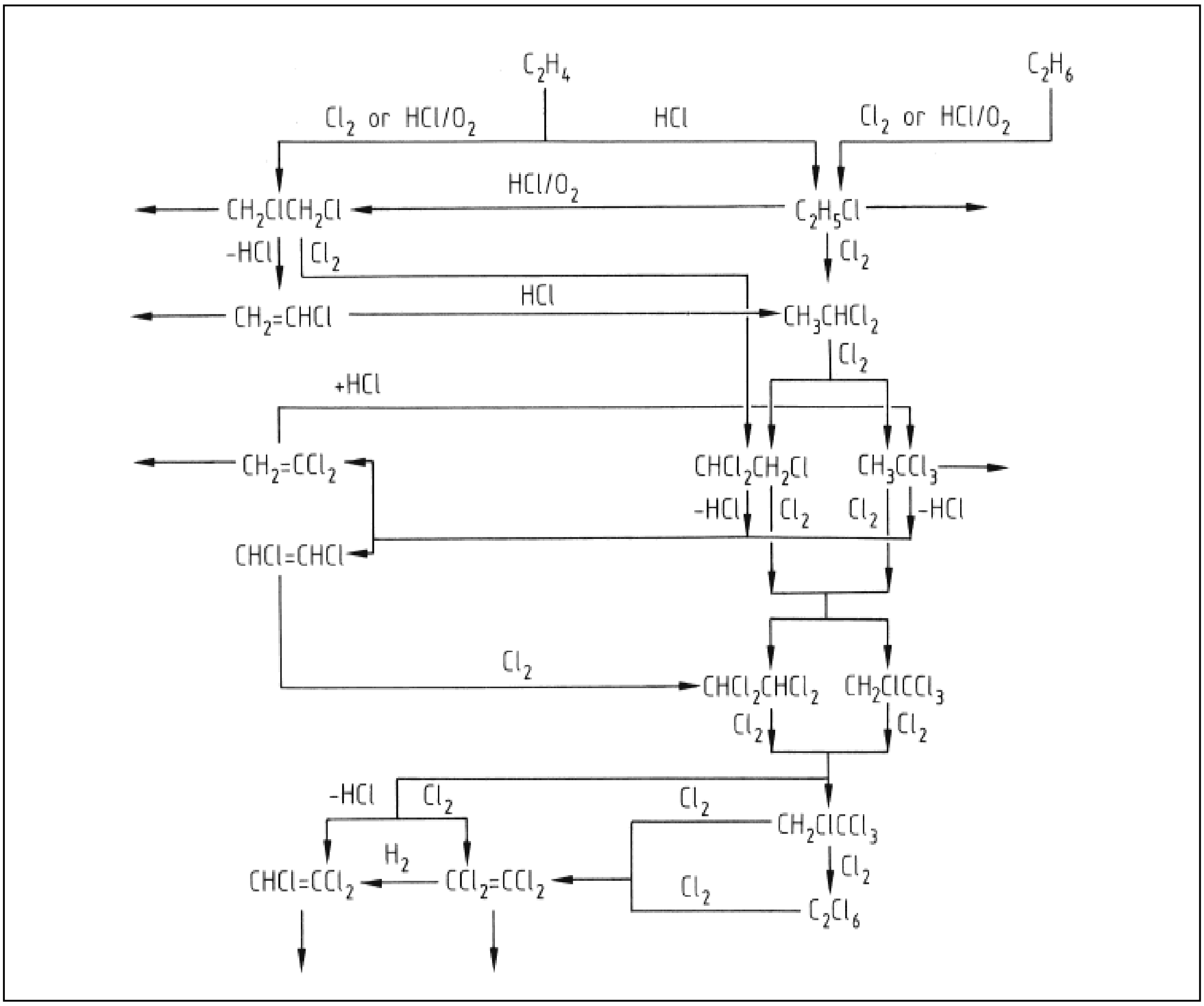


Fig. 2.2.4-1: *Chlorinated hydrocarbons from ethane and ethylene (simplified)*

(3) History and Use of CHC

(3.1) Chlorine derivates of methane

play an important role in industry

Monochloromethane

first synthesized in 1835. The first commercial methane chlorination facility was built by „Farbenwerke Hoechst“ (Germany) in 1923.

Use: production of tetramethyl-lead (gasoline); production of silicones.

Dichloromethane

was prepared for the first time in 1840.

Use: solvent (cleaning, paint remover); pressure mediator in aerosols; extraction technology (coffee, paraffin, ...)

Trichloromethane

was produced for the first time in 1831 by „von Liebig“ and „M. E. Souberrain“. 1847 trichloromethane was introduced into the field of medicine by „J. Y. Simpson“ as an inhaled anaesthetic.

Use: production of CFC 22; Production of PTFE

Tetrachloromethane

was first synthesized in 1839. Originally it played a role in dry cleaning and as a fire extinguishing agent.

Use: production of CFC 11 and CFC 12

(3.2.) Chlorine derivates of ethane

also play an important role in chemical industry mainly as an intermediate in synthesis processes.

Monochloroethane

is thought to be th first synthesized CHC, 1440 (!!) by „Valentine“ (ethanol + hydrochloric acid). Production in 1984 (western world) ~ 300.000 t.

Use: since the 1920s as a starting material for the production of tetraethyl-lead (gasoline).

1,2-Dichloroethane

was first synthesized 1795 (!), Production in 1985 (world) ~ 17,5 mio t.

Use: starting material for Polyvinylchloride (PVC).

1,1,1 – Tirchloroethane

was first synthesized in the mid-19th century but was not used in industry for more than 100 years (1,1,1 is very unstable). The commercial production started in the 1950s by „Dow Chemical “. Production in 1984 (EU and USA) ~ 600.000 t.

Use: solvent (cleaning and degreasing).

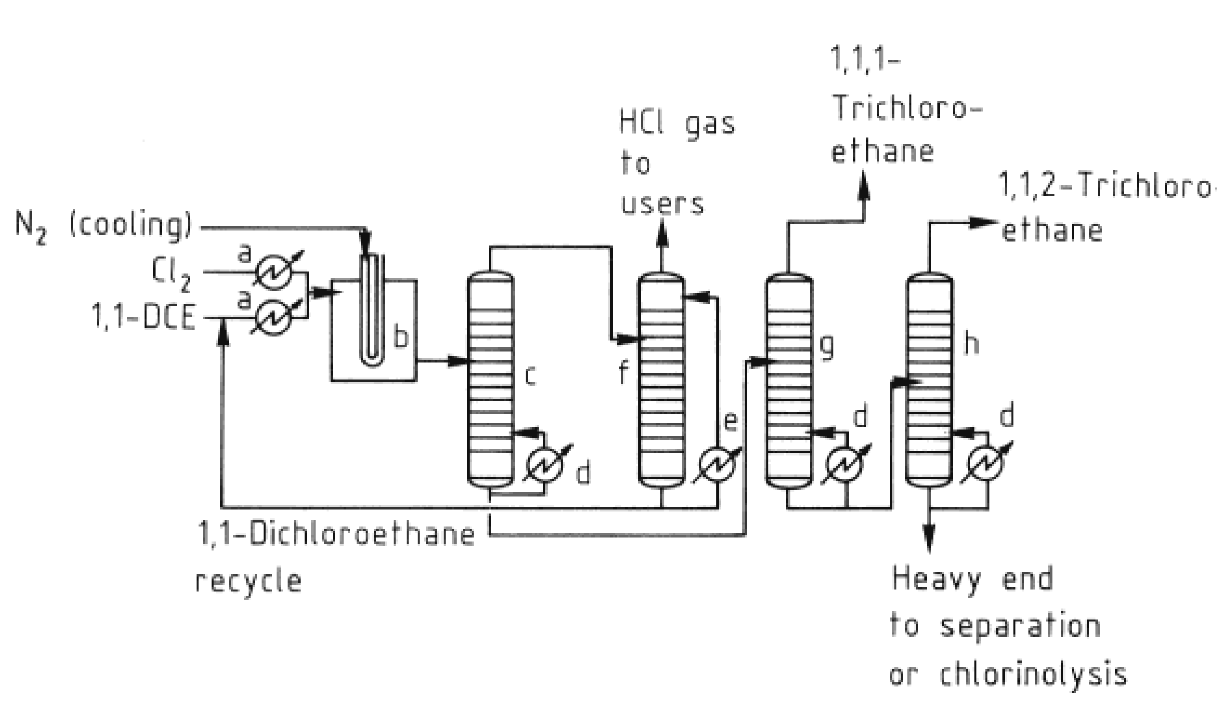


Fig. 2.2.4-2*: 1,1,1-Trichloroethane process (photochlorination): a) Preheater; b) Photoreactor; d) Reboiler; e) Cooler; f) HCl tower; g) 1,1,1-Trichloroethane tower; h) 1,1,2-Trichloroethane tower*

(3.3.) Chlorine derivates of ethylene

very important substances (Tri, Per) and starting material for polymeres (PVC)

Vinyl Chloride (monochloroethylene)

is in addittion to ethylene and NaOH one of the worlds most important chemical. First synthesis – 1830 – 1834 by „V. Regnault“. Industrial production started in the 1930s (catalytic hydrochlorination of acetylene). Since 1955 ethylene is used. World production in 1984 ~ 15 mio t !

Use: 95 % for PVC !;
5 % for 1,1,1 – Trichlorethane a.o.

Trichloroethylene

first developed in 1864. The first plant was built 1908 in Yugoslavia (it still works). Production in 1984 ~ 400.000 t.

Use: solvent (vapor degreasing, extraction, ...)
production of PVC (a control agent)

Tetrachloroethylene (Perchloroethylene)

first synthesis in 1821 by „M. Faraday“! The most stable derivative of all chlorinated ethanes and ethylenes. Industrial production started ~ 1910, in the 1950s Per became the most important dry cleaning solvent.

Production in	1972 (world)	~ 700.000 t (USA 320.000 t)
	1978	~ 1,1 mio t (USA 330.000 t)
	1982	~ 750.000 t (USA 265.000 t)
	1985	~ 650.000 t (USA 159.000 t)

Use: solvent in dry cleaning (~60%)
Textile finishing, dyeing, extraction

(3.4.) Chlorinated biphenyls

polychlorinated biphenyls (PCB) seemed to be ideally suited for the use in many fields of application (transformers, plasticizer,...); PCB - production 1930: ~ 1 mio t !!! 30 – 40 % of this quantity is still in use !!! (today - no production !?!)

- 209 possible chlorinated biphenyls
- high chemical and thermal stability
- excellent electrical property data of PCB
- first industrial use began in 1929 in the USA
- mid 1960s – accumulation in nature was proved
- in the late 1970s – Dioxins and Furans (at ~500 – 800°C)

Use: in transformers and capacitors
as flame-retardant additives
as plasticizers for lacquers, plastics,...
water-repellent additives for coatings
incumbustible hydraulic fluids
dust control agents for road construction !!!

Trade names of chlorinated biphenyls

Apirolio	Caffaro, Italy
Aroclor	Monsanto, USA, UK
Clophen	Bayer AG, FRG
Delor	Chemco, CS
Fenclor	Caffaro, Italy
Inerteen	Westinghouse, USA
Kanechlor	Kanegafuchi, Japan
Pyralene	Prodelec, France
Pyranol	Monsanto, UK
Pyroclor	Monsanto, USA

Sovtol	USSR

(3.5) Chlorophenols

broad spectrum of antimicrobial properties:

- fungicides
- herbicides
- insecticides
- ovicides
- algicides

production: ~ 100.000 t/a

Use: agricultural chemicals (80 – 90%)
pharmaceuticals
biocides (PCP,...)

(3.6) Organochlorine insecticides

DDT (1,1´-(2,2,2-trichlorethylidene)bis(4-chlorobenzene))

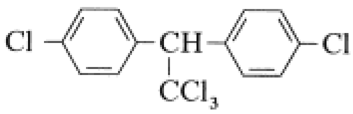
was first synthesized 1874 by „O. Zeidler“, insecticidal properties were discovered in 1939 !!

the most persistent of all the commonly used contact insecticides

(1969 – the average US inhabitant had ~3mg/kg of DDT stored in body fat) !!!

toxicity: LD50(rat) = 113 mg/kg (oral) – big difference between fish (LC50 = 0,002 mg/kg) and birds (LD50 = 1300 mg/kg)

Use: insecticide for e.g. fruits, cotton, potatoes, ...
Malaria control



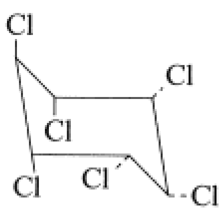
DDT

Lindane (γ-hexachlorocyclohexane)

was first produced in 1825 by „Faraday“. Insecticidal properties were discovered in 1941 !!!

toxicity: LD50 (rat) = 89 mg(kg

Use: seed dressing
soil inseciticide
malaria



Lindane

(4) Environmental Considerations

(4.1) Toxicity

***Table 2.2.4-1**: Single dose oral toxicity of common chlorinated C1-C4 aliphatic hydrocarbon*

	LD_{50} (oral, rats; other species specified), mg/kg	Probably nature of death[a]
Chloromethane (methyl chloride)	gas	–
Dichloromethane (methylene chloride)	2 000	A
Trichloromethane (chloroform)	2 000	A, LK
Tetrachloromethane (carbon tetrachloride)	3 000	A, LK
Monochloroethane (ethyl chloride)	gas	–
1,1-Dichloroethane (ethylidene dichloride)	>2 000[b]	–
1,2-Dichloroethane (ethylene dichloride)	700	LK
1,1,1-Trichloroethane (methyl chloroform)	10 000–12 000	A
1,1,2-Trichloroethane (vinyl trichloride)	100–200	LK
1,1,2,2-Tetrachloroethane	ca. 300 (dogs)	–
Pentachloroethane	□1 750 (dogs)	–
Hexachloroethane	6 000	–
Monochloroethylene (vinyl chloride)	gas	–
1,1-Dichloroethylene (vinylidene chloride)	1 500	LK
1,2-Dichloroethylene (cis and trans)	1 000–2000	A
Trichloroethylene	4 900	A
Tetrachloroethylene (perchloroethylene)	2 000	A
2-Propyl chloride (isopropyl chloride)	>3 000 (guinea pigs)	A
1,2-Dichloropropane (propylene dichloride)	2 000	A
3-Chloropropene (allyl chloride)	450–700	LK
2-Chloro-1,3-butadiene (chloroprene)	250	LK
Hexachlorobutadiene	200–350	LK

[a] A = Anesthesia, LK = Liver and kidney injury;

[b] Unpublished data, The Dow Chemical Company, Midland, Michigan, USA.

***Table 2.2.4-2**: MAK and TLV values of chlorinated biphenyls*

	MAK FRG mg/m^3	TLV USA mg/m^3
Chlorinated biphenyls (42% Cl)	1 III B	1
Chlorinated biphenyls (54% Cl)	0.5 III B	0.5

***Table 2.2.4-3**: Acute oral toxicity of PCBs*

Chlorine content, wt%	LD_{50} (rat, oral) g/kg
21	3.98

Chlorine content, wt%	LD_{50} (rat, oral) g/kg
32	4.47
42	8.65
48	11.0
62	11.3
68	10.9

(4.2) Persistence, bioaccumulation and reaction in the lower atmosphere with OH-radicals

***Table 2.2.4-4**: Tropospheric residence time of aliphatic chlorinated hydrocarbons*

Compound	Time, a
Dichloromethane	0.23
Trichloromethane	0.33
Tetrachloromethane	> 30.0
1,1,1-Trichloroethane	2.7
Trichloroethylene	0.01
Tetrachloroethylene	0.18

***Table 2.2.4-5**: Concentrations of CHC in the environment*

seawater:	CHCl3, CCL4	~ 1-10 ng/l
rainwater:	Tri Per	to 3.000 ng/l (1979) to 51.000 ng/l (1981)
Danube:	Tri, Per	~ 1 µg/l (1982)
atmosphere:	1,1,1-tri Per CHCl3	~ 800 ng/m³ (1987 – 1989) ~ 50 ~ 50
food:	Lindan DDT PCB	80 µg/kg fat (fish, 1986) 11 (milk) 1166 (fish) 17 (milk) 2100 (fish) 72 (milk)

***Table 2.2.4.-6**: Atmospheric concentration of chloromethanes (in 10–10vol.%)*

Compound	Continents	Oceans	Urban areas
CH_3Cl	530 . . . 1040	1140 . . . 1260	834
CH_2Cl_2	36	35	<20 . . . 144
$CHCl_3$	9 . . . 25	8 . . . 40	6 . . . 15 000
CCl_4	20 . . . 133	111 . . . 128	120 . . . 18 000

***Table 2.2.4-7**: Velocity of decomposition of chloromethanes in the atmosphere -halflife (weeks)*

Compound	
CH_2Cl_2	15

Compound	
$CHCl_3$	15
CCl_4	>1000

(4.3) Example of physical properties of an important CHC - tetrachloroethylene

Tetrachloroethylene is a colorless heavy liquid with a mild odor. It is soluble with most organic solvents and exhibits high solvency for organic compounds. Tetrachloroethylene is neither flammable nor does it form explosive mixtures with air.

***Table 2.2.4-8**: Physical Properties of Tetrachloroethene*

M_r	165.8
Mp	– 22.7 °C
bp at 101.325 kPa	121.2 °C
density at 20 °C	1.623 g/cm^3
n_D^{20}	1.5055
Vapor pressure at	
0 °C	0.590 kPa
20 °C	1.900 kPa
40 °C	5.470 kPa
80 °C	30.130 kPa
120 °C	100.000 kPa
Heat of evaporation (boiling point)	34.7 kJ/mol
Vapor density (boiling point)	5.8 kg/m^3
Critical temperature	620.3 K
Critical pressure	9740 kPa
Surface tension at 20 °C	32.1×10^{-3} N/m
Viscosity at	
20 °C	0.88×10^{-3} Pa · s
80 °C	0.54×10^{-3} Pa · s
Coefficient of cubical expansion (0–40 °C)	0.00102 K^{-1}
Dielectric constant at 20 °C	2.20
Solubility in water at 25 °C	150 mg/kg
Solubility of water in tetrachloroethylene at 25 °C	80 mg/kg

2.2.5. Technical Standards for Plants Using CHC (Including Technologies to Reduce CHC Emissions)

(Wilhelm MUCHITSCH, Austrian Federal Ministry for Economic Affairs, Vienna, Austria)

(1) Hazards and physical properties

CHC (Chlorinated Hydrocarbons) are organic compounds with a low boiling point. The most common are particular

- Tetrachloroethene (TCE, Per, Perchloroethylene, Tetrachloroethylene),
- Trichloroethene (Tri, Trichloroethylene),
- 1,1,1-Trichloroethane (Methylchloroform) and
- Dichloromethane (Methylenechloride).

CHC's are used for the treatment of metallic and non-metallic objects, especially for

- degreasing,
- greasing,
- cleaning,
- drying,
- correction of film materials,
- cleaning of textiles, leather and raw goods.

CHC's have excellent oil- and grease-dissolving properties. Therefore any skin contacts are to be avoided.

With the exception of the completely non-flammable Tetrachloroethene, CHC's are all almost non-flammable. But sometimes CHC's could be mixed with other flammable solvents (e.g. Methanol and Ethanol) for special cleaning processes. They can then form explosive vapour-air mixtures.

Some individual CHC's pose a health hazard (toxic, narcotic effect, cancerogenity, mutagenity, etc.). Therefore, the safety data-sheets referring to the individual substances have to be considered.

When operating a CHC-plant, a consequence of a damage or a handling error might be that chlorinated organic solvents will be released from the plant in either liquid or evaporated form, which would then cause an increased concentration of CHC's in the room-air. If the liquids, which were set free, could not be caught by the collecting devices, CHC's could leak into the soil as liquids. In addition, diffusion caused by increased room-air concentrations may also lead to a penetration into the soil. Due to their practically non-existent degradability in the soil, solvents having penetrated into the soil this way will remain in the ground for years or decades. Due to their persistence, CHC's are generally regarded as substances hazardous to water and to be typical problem substances for the groundwater in cities, respectively in valleys or basins with a lot of industry and trade.

In water-cooled CHC-plants, even a slight cooler-damage (e.g. hairline cracks) can cause CHC-contaminated cooling water.

CHC's have a higher specific weight than water and are differently soluble in water. The kinematic viscosity of the CHC's is essentially lower than that of water. This property, in connection with their relatively high density, will enable them to penetrate into other materials - even into very dense ones, as for example water-resistant concrete - and to sink through them. This is why they can percolate easily and quickly into the soil as well as into any rooms adjacent to CHC-plants. This physical property was also confirmed in practice, by measuring series that were carried out in flats or apartments situated directly above CHC-plants. Increased levels of CHC-concentration in the indoor-air have been found, and as a consequence there also exists an unwanted increase of CHC in foodstuffs rich in fats, so that these do not comply with the foodstuff regulations any more.

Under the influence of light, air, heat and humidity, as well as certain impurities, all CHC's have a varying tendency towards decomposition, whereby, amongst others, hydrochloric acid and to a small extent also Carbonyldichloride (Phosgen) may be produced. Trichloroethene, 1,1,1-Trichloroethane and Dichloromethane, not however Tetrachloroethene, decompose in the presence of aluminium and alloys containing aluminium. This transformation accelerates itself and may even lead to glowing. Thus, some products contain stabiliser-mixtures of different compounds in order to avoid decomposition, so that with them also light metals can be degreased.

Consequently, it seems to be of utmost importance for the granting of new permits, as well as for adaptations of older plants, and also for the inspection of plants in which CHC's are used or stored, that the overall framework of required measures and procedures should be standardised and harmonised.

Table 2.2.5-1*: Characteristic quantities of Tetrachloroethene (Source: OENORM M 9401)*

Parameter	**Unit**	
Relative molar mass	g/mol	165,8
Density	g/cm³	1,62
Boiling pt. (1013,25 hPa)	°C	121,1
Solubility in water at 20°C	Mass share in %	0,016
	Mass concentration in g/l	0,1
Boiling pt. of the Azeotrope solvent / water	°C	87,1
Solvent share of the Azeotrope	Mass share in %	84,1
Steam pressure (20° C)	mbar	18,9
Saturation concentration (20° C)	g/m³	129
Saturation concentration (30° C)	g/m³	211
Ignition temperature in air	°C	-
Beginning of decomposition	°C	approx. 150
Relative evaporation no. (Ether=1)		11
Surface tension at 25°C	N/cm	$3{,}2x10^{-4}$
Kinematic viscosity at 20°C	mm²/s	0,54
Odour threshold level	ppm	5 to 50
Workplace-air-limit-value 1994	ppm	50
Conversion factors	1 mg/m³ in ppm	0,145
(20°C, 1013,25 hPa)	1 ppm in mg/m³	6,89

Table 2.2.5-2*: Characteristic quantities of Trichlorethene (Source: OENORM M 9401)*

Parameter	**Unit**	
Relative molar mass	g/mol	131,4
Density	g/cm³	1,46
Boiling pt. (1013,25 hPa)	°C	86,7
Solubility in water at 20°C	Mass share in %	0,11
	Mass concentration in g/l	1,0
Boiling pt. of the Azeotrope solvent / water	°C	73,6
Solvent share of the Azeotrope	Mass share in %	93,4
Steam pressure (20° C)	hPa	77
Ignition temperature in air	°C	410
Beginning of decomposition	°C	approx. 120
Relative evaporation no. (Ether=1)		3
Surface tension at 25°C	N/cm	$3{,}2 \times 10^{-4}$
Kinematic viscosity at 20°C	mm²/s	0,40
Odour threshold level	ppm	20 - 400
Workplace-air-limit-value 1994	ppm (mg/m³)	50 (270)

Parameter	Unit	
Conversion factors (20°C, 1013,25 hPa)	1 mg/m³ in ppm 1 ppm in mg/m³	0,183 5,46

Table 2.2.5-3 *Characteristic quantities of Dichloromethane (Source: OENORM M 9401)*

Parameter	Unit	
Relative molar mass	g/mol	85
Density	g/cm³	1,33
Boiling pt. (1013,25 hPa)	°C	40
Solubility in water at 20°C	Mass share in % Mass concentration in g/l	1,7 17
Boiling pt. of the Azeotrope solvent / water	°C	38,1
Solvent share of the Azeotrope	Mass share in %	98,5
Steam pressure (20° C)	hPa	435
Ignition temperature in air	°C	605
Beginning of decomposition	°C	approx. 120
Relative evaporation no. (Ether=1)		1,9
Surface tension at 25°C	N/cm	$2{,}8 \times 10^{-4}$
Kinematic viscosity at 20°C	mm²/s	0,32
Odour threshold level	ppm	25 - 210
Workplace-air-limit-value 1994	ppm (mg/m³)	100 (360)
Conversion factors (20°C, 1013,25 hPa)	1 mg/m³ in ppm 1 ppm in mg/m³	0,283 3,53

(2) Measures to prevent pollution and minimise emissions

(2.1) Technical possibilities to reduce air-emissions

CHC's are used in many companies and in many different processing plants. Thereby the reduction of emissions in low concentrations of CHC's and large amounts of exhaust-air represents a particular problem; that is why operating modes have to be chosen or modified to guarantee small amounts of exhaust-air. In this connection it is not allowed to mix any air that does not come from the process with the exhaust-air so as to dilute it.

All CHC-vapours shall be collected next to the spot where they are produced (e.g. by encapsulation of the machines and devices, or of parts of those). The exhaust-devices have to be arranged and dimensioned in such a way that any escape of CHC's into the ambient air is prevented.

To reduce CHC-emissions of waste-gas into the air, in particular the following methods can be used, even as a combination :

- Condensation by indirect cooling,
- Condensation by compression and cooling down,
- Adsorption (accumulation in solids with a large interior surface).

(2.1.1.) Condensation by indirect cooling

If a vapour-air mixture is cooled down to temperature below its dew point, condensed fluid continues to form until the saturation pressure is reached. For this process, water cooling, air cooling and cooling systems utilising refrigerating equipment are used. The lower the temperature and the overall pressure of the vapour-air mixture is, the lower is the obtained vapour concentration in the waste-gas. CHC-vapours can thus partly be discharged from the waste-gas by cooling the mixture, or by cooling and compressing it. The coolant cycle and the air containing CHC are thus separated from one another. Within this cycle, the air is fed back into the process which it has been taken from, or is fully or partly exhausted and cleaned by adequate adsorption devices.

Degreasing plants which work with boiling solvents and/or hot CHC-vapours can also be operated without producing too many emissions, if it is guaranteed that a layer of refrigerated air will remain above the condensation zone.

However, condensation alone does not suffice for cleaning waste-gas (at approx. –20 °C the saturation concentration for Tetrachloroethene is about 13 g/m³), because it cannot bring about the required low emission values (< 20 mg/m³). Condensation is only used as a pre-stage for an waste-gas cleaning plant.

(2.1.2.) Adsorption

Solids with a large interior surface are used as adsorption substances, because of an accumulation of CHC's by means of physical adsorption or capillary condensation can take place. The adsorption capacity of a certain adsorption substance is, above all, influenced by the raw gas concentration, the temperature and the boiling point of the substance to be adsorbed, as well as by the contact time. The adsorption capacity can be increased by an increase of the pressure in the adsorber. In most cases, the adsorbent can be regenerated, whereby the adsorbed substance is regained.

The waste-gas to be cleaned is led through adsorbers which are filled with an adsorbent (active charcoal, silicate gel, molecular sieves, adsorption resins and many more). The working process may be discontinuous or semi-continuous.

If the waste-gas contains additives blocking the capillaries of the adsorbent (e.g. resin-forming substances), and thus disturbing both adsorption and regeneration, pre-cleaning stages (congestion separators, oil-covered filters, etc.) should be installed. The adsorbent can be regenerated with steam, hot air or hot inert gas.

(2.2.) Technical possibilities to reduce waste-water emissions

In CHC-plants as well as during the regeneration of the adsorbent of the waste-gas cleaning equipment, CHC contaminated water (contact water) can be produced.

To reduce the CHC-concentration in the contact water and to keep the emission limit levels down at 0,1 mg/l (this refers to chlorine), the following methods or a combination of the same may be applied:

- Stripping
- Adsorption

For both methods, pre-cleaning through gravity separation is a must. As a consequence of their different density, the CHC's which are not dissolved in the water are separated from the water in a special solvent separator (safety separator). After a sufficiently long staytime of the CHC/water-mixture in the separator, a separation into an aqueous (contact water) and a CHC-phase takes place. The CHC-phase is fed back into the process which it was taken from or is disposed according to the regulations of the Waste Disposal Act.

(2.2.1.) Stripping

After being pre-cleaned in a solvent separator (safety separator), the contact water is cleaned by the blowing in of air or inert gas. During this process, the CHC's dissolved in the water become gaseous and are exhausted with the streams of either air or inert gas. This exhaust-air must, in its turn, be filtered again, because otherwise no reduction of emissions, but only a shifting of the emissions from water to air would be the consequence.

It must, however, be taken into consideration that due to the different input concentrations that have been caused by the different dissolving media (e.g. tensides, alcohols), it is very problematic to keep the required low emission value for the cleaned waste water.

(2.2.2.) Adsorption

Solid substances with a large inner surface, on which the CHC's can be accumulated by adsorption, are used as adsorbents. After being pre-cleaned in a gravity separator (safety separator), the contact water is led through the adsorption plant. This can be done discontinuous or semi-continuous.

(2.3.) Requirements for installation and use of CHC-plants

During the operation of a CHC-plant, a person must be present who is knowledgeable about the servicing and procedures of the plant. This person must also be knowledgeable about the dangers of dealing with CHC's and wastes containing CHC's, so that the required measures immediately can be met in the event of a malfunction or a leakage of the plant.

(2.3.1.) Machinery

For the degreasing, cleaning and drying of metallic and non-metallic objects with CHC's a great number of equipments are generally used (beginning with the simple open manually operated "degreaser" and ending with the fully encapsulated plant).

As the CHC's already have a very high saturation vapour pressure at room temperature, and are thus highly volatile, the solvent vapours diffuse into the air space above the liquid solvent, respectively the solvent vapour zone (with boiling solvents).

In open equipments, the dipping of the objects to be degreased displaces the corresponding volume of solvent vapour and sets this vapour free in the work room. That is why special measures (e.g. air extraction at the edges) must be applied to guarantee that the air-limit-values at the workplace are not exceeded. In general, large amounts of exhaust air had to be sucked off, which resulted in a great loss of solvents (above average).

Note: Open equipments do not comply with state-of-the-art technology any more !

In encapsulated plants the workplace-air-limit-values can generally be adhered to better with only small amounts of exhaust air. Through the right dimensions and construction of the exhaust system, a slight under-pressure results inside an encapsulated plant, so that only very slight amounts of solvent vapours can leak into the workroom.

The exhausted air contains CHC's and must be cleaned before discharged (see point 2.3.3).

In order to keep the solvent concentration at the workplace below the workplace-air-limit-value, it is important that the treated objects leave the plant free of any solvents. This is achieved, for example, by turning the objects (e.g. with sack openings) and by adhering to the required drying time.

With CHC-plants the charging and/or withdrawal opening must be locked during operation and the interlock is to be controlled during the ventilation phase by a measuring instrument which releases the interlock only when concentrations fall below 1g CHC/m³. For measuring the mass concentration of CHC in the treatment zone of the CHC-plant, the total length of each individual test should be 30 seconds.

Plant sections that are equipped with a cooling register, must be equipped with a coolant shortage safety system. With the activation of the coolant shortage safety system, the energy intake to the monitored plant section must be automatically interrupted; the coolant shortage must be easily recognisable and displayed, both visually and audibly.

For cleaning out the distillation sludge, a closed system with a gas balancing is to be equipped.

The filling of the CHC-plants with CHC's is to be done with a gas balancing or with a filling system of the same type (closed system).

(2.3.2.) Building construction

CHC-plants are to be seen as problematic when they border apartments or plants which produce, store, consume or transport foodstuffs (hereafter named foodstuff plants). Experience has shown that especially with fat-containing foodstuffs contamination with CHC's can occur.

General measures

CHC-plants and the plant sections which belong to them (including waste-gas and waste-water cleaning units) must be set up in separated rooms. If this is not possible due to operating conditions, then a special ventilation for their set up area is necessary (includes a 3 metre buffer zone around the CHC-installation). The doors of the room for the CHC-plants have to be self closing and should open toward the outside. The floor of these rooms must be moisture proof, and no floor (drainage) channels are permitted. The windows of the processing areas of the CHC-plants are not to be opened, with the exception of an emergency, or should be unable to be opened.

Special measures for CHC-plants in apartment blocks or adjacent foodstuff plants:

Processing rooms of the CHC-plants are to be equipped, at minimum, with a diffusion barrier on the ceiling, and when needed on the separating wall if they border to unrelated residences or foodstuff plants.

If there are no separate processing rooms available (i.e. with older plants), then the diffusion barrier is to be installed, in each case, over the set up area of the CHC-plant, the manipulation area and the storage area for freshly cleaned products.

Diffusion barriers are to be built as dependent and rear ventilated ceilings. Instead of these ceilings a treated wallpaper with a diffusion resistance coefficient of at the most 25 µg/(m².Pa.h) or another covering of the same value could be installed. The maintenance of the required diffusion resistance coefficient is to be ensured by a certification. The laying of the diffusions barrier is to be carried out by a firm specialised in such business. A confirmation is to be provided, showing that the installation was made by such a firm.

Requirements for dependent rear ventilated ceilings and/or rear ventilated preventive covers:

- They must have a tight joint sealing (i.e. plaster tiles, wood panels, metal plates in each case glued and airtight).
- The rear ventilation must occur from the printed side (forced ventilation)
- The distance of air space must be at least 3 cm.
- A minimal air circulation of 1.5 times per hour must be reached.
- The intake fan must constantly be in operation (day and night).
- The fresh air is to be pre warmed. The ways and means of this pre-warming is to be confirmed with the expert responsible for the building technique (tip: cooling of the ceiling could cause condensation resulting in mildew formation).
- The exhaust air from the rear ventilated ceiling may not be routed into an other room.
- Verifiable documentation is to be provided as to the mounting and construction of the rear ventilated ceiling (i.e. report, production plans, photos).

(2.3.3.) Air ventilation and waste-gas treatment

Rooms of CHC-plants must be equipped with a ventilation and air extraction system. A minimal air circulation of 5 times per hour must be reached.

In larger buildings, in which due to operating conditions a single processing room cannot be created, a minimum air exchange (ventilating and extraction) of 8 times per hour must be maintained in the manipulations area (includes a 3 metre buffer zone around the CHC-installation).

The room air must be extracted near the ceiling and the floor. This extracted exhaust air is to be lead through a duct to the outside at least 1 m higher then the roof-ridge. In this cases no cleansing of the exhaust air is required. The extracted room air is not to be lead over the adsorber of the CHC-installation (dissipation, blowing out of CHC from the active charcoal).

The fresh air intake should be fitted to local conditions, however it should be located if possible in the vicinity of the ceiling. It is to be noted that the exhaust and intake should be located as far from each other as possible (cross ventilation).

The exhaust air from the CHC-plant contains CHC-vapours and is to be routed through a waste-gas cleansing. In new plants, a circulation of this air stream is state of the art.

With the use of active charcoal as adsorption material for waste-gas cleaning, the following conditions should be observed:

- With installation of the active charcoal units, warming from the outside should be avoided (installation in the vicinity of the floor and away from any heat producing parts).
- The active charcoal unit must be dimensioned so that it will not be overburdened during one day (with the exception of automatically regenerated charcoal units).
- For the optimal use of the active charcoal unit, the current speed (without observation of the filter resistance, v_{linear}) should lie between 0.25 m/s and 0.35 m/s with contact time at approximately 2 to 4 seconds.
- If the cleaned waste-gas is lead out of two or more active charcoal units into one joint duct, it must be ensured that with a shut down of one of these units, no uncleaned waste-gas can escape from this.

The cleaned waste-gas should be vented depending on the local conditions and if possible as follows:

- Exhaust opening:
  - a minimum of 1 metre above the roof-ridge or
  - a minimum of 3 metres above flat roofs or shed roofs or
  - a minimum of 5 metres above the roofs of residential houses in a circumference of 50 metres but
  - in every case 10 metres above the ground surface.

- The air speed at the exhaust opening must be at least 7 m/s. However it should be observed that with higher air speeds increased noise emissions can be expected.
- The discharge of the *cleaned* waste-gas can occur with the room air, whereby the exhaust opening is to be situated at least 1 metre over the roof ridge. It should be ensured that, with the combination of different exhaust vents, the waste-gas cannot stream back in.
- The discharge must occur unrestricted and perpendicular.
- The ducts for discharge of the cleaned waste-gas are permitted only outside of the building.

The mass concentration of CHC allowed in the cleaned waste-gas is not to exceed 20 mg/m³. The mass concentration is to be related at 0°C and 1013 mbar.

(2.3.4) Water protection and waste-water treatment

CHC-plants including in all cases the manipulations areas must be set up within collecting devices made of galvanised tin or other material of the same properties (diffusion proof, water tight and resistant to CHC's). Each collecting device must be able to catch the entire amount of CHC's.

The pipes for CHC's outside of the collecting device must be installed to the collecting device with a free-grade overhead piping.

If the filling of the solvent tanks does not occur in the collecting device of the CHC-plant, the filling of the tanks is to occur over fixed overhead free-grade pipes to the collecting device. The manipulation area of the filling station is to be constructed as collecting device.

The storage of CHC's and wastes containing CHC's may only occur in crash-proof and diffusion proof containers within collecting devices.

Collecting devices in the outside must be sheltered against rain.

The contact water is to be cleaned on site or must be collected for external removal.

An attached piping and gas balancing is to be provided between the water separator (of the CHC-installation, the distillation, the active charcoal unit, ...) and the safety separator of the contact water cleaner or between the water separator and the collection container for removal (e.g. with a bayonet closure).

The cleaned contact water can either be lead into the public sewer system or into a pre-flooder (needs an approval of water acts), or can be merged into the cool circulation. It is to be determined in each case whether the introduction of the cleaned contact water in the cooling water circulation is possible. However it should be ensured that the cleaned contact water does not come into contact with air containing CHC's (fixed piping).

The cooling water of the CHC-plants must circulate within a closed system. The air for air-cooled cooling towers must be taken directly from outside or from areas that do not contain CHC's. Before draining the cooling water into a open sewer system or into a pre-flooder, this water is to be examined for the content of CHC's.

The mass concentration of CHC allowed in the cleaned waste-water or the cooling water is not to exceed 0,1 mg/l. The mass concentration is to be related to chlorine.

With the external removal of the contact water or contaminated cooling water, the performance and responsibility of the removal is to be ensured. For this purpose, a flowmeter (resistant to the solvent material) is to be built in between the water separator and the collection container (continual monitoring of the amount or charge). Records are to be made which show clearly the amount of the contact water that has been removed, and which also make obvious the adherence to the regulations for removal of hazardous wastes.

(2.3.5.) Protection of the soil

In order to ensure that remediation is carried out in a timely manner, it is required that the concentration of chlorinated solvents in the soil-gas is examined. This should be done after a leakage accompanied by raised room air concentrations of CHC or by release of solvents but in any case at least annually.

For this purpose the installation of a soil-gas extraction system, which enables to sample soil-gas from the ground unsaturated by water, must be available. This is to do with a stationary equipment (soil-gas sensor in accordance with the Austrian Standard ÖNORM S 2090; rammed in or with preliminary drilling) and it should be installed at least in the following areas:

- under or directly near the processing room or the processing area of the CHC-plants,
- under or directly near the areas where CHC's are stored and

- under or directly near the areas where CHC-contaminated wastes are stored (e.g. distillation sludge).

If there is more than one basement or a parking basement under the area, there is no need for a soil-gas sensor. In special cases, it would be good to check whether a one time measurement would make sense.

The soil-gas sensor may not be located more than 2 m horizontally away from the CHC-plant or from one of the above named processing areas. In special cases, more than one soil-gas sensor may be required per CHC-plant. The diameter of the sensor should lie between 2 and 5 cm. The point of the soil-gas sensor should lie at a minimal depth of 1 metre and a maximum of 2 metres under the soil surface or the surface of the floor (in basement floors). The location of the soil-gas sensor is to be drafted in the blueprints or in the map of the plant. If the soil-gas sensor was installed with preliminary drilling, it is useful and important to make a description of the soil-structure.

The mass concentration of CHC allowed in the soil-gas is not to exceed 20 mg/m³. The mass concentration is to be related at 0°C and 1013 mbar. If it exceeds the authorities must be informed.

2.2.6. Alternatives to CHC

(Norbert SCHIESS, Government of Saxony, Ministry of Environment and Agriculture, Dresden, Germany)

(1) Executive Summary

Alternatives on the use of Chlorinated Hydrocarbons (CHC’s) have to struggle against the following facts:

- The chemical industry needs a lot of Sodium Hydroxide
- NaOH is produced out of rock salt (NaCl) by electrolysis and chlorine is a kind of „waste product“
- Chlorine is "very cheap"
- You can't use the whole production of chlorine for PVC
- New applications for chlorine were necessary (CHC, PCB, PCP etc.)
- Chlorinated hydrocarbons have excellent chemical an physical properties such as:
  - high degreasing potential at low temperature
  - surface cleaning and degreasing without remains
  - non flammability

Because of the groundwater contamination with CHC's in the 80‘s – the main reason were large degreasing facilities and dry cleaners - Germany enacted the Second Ordinance to the Federal Immission Control Act (Bundes-Immissionsschutzgesetz BImSchG) in 1986. Since this time, the users of CHC's had to do a lot of measures to prevent the environment from CHC-emissions in the air, water and soil. There are only 3 CHC's allowed to use in surface treatment facilities, dry-cleaning machines and extraction installations

- Dichloromethane CH_2Cl_2
- Trichloroethylene C_2HCl_3
- Tetrachloroethylene C_2Cl_4

In the step of renewing the old installations the local authorities pushed the users of CHC’s to think about alternative substances.

There were two different ways to go. The first way is to replace the use of CHC by non-halogenated hydrocarbon solvents (HCS). The second way was to use water-based cleaners.

(2) Alternatives

In 1994, in Germany the systems used for metal treatment with a filling volume of over 50 l were divided in a ratio of 1 : 4 between chlorinated hydrocarbon systems and other types. There were approx. 35.000 systems in work; 7.000 with CHC's and 28.000 with alternatives. I have data from the year 1991 about the number of systems using aqueous media. (25.000). Therefore it can be assumed that the "other types" were overwhelming water-based cleaning systems. It is estimated that approx. in 10 to 15 % of cases it was not yet possible to substitute CHC's. This depends on cleaning processes for parts with difficult geometries.

(3) Some Examples of Metal Surface Cleaning with HCS

1. **Drills and millings** out of metal or ceramics can be cleaned and degreased with cyclohexane in four stages:

- -ultrasound-cleaning at 75°C
- -washing at 45° C
- -washing with saturated vapour at 81° C
- -drying

2. The cleaning and degreasing of **parts of pumps** has changed from the use of Trichloroethylene to the use of a mixture of non aromatic hydrocarbons called Shell C 153 and demineralised water. The installation is a one chamber-installation with two liquid containers; the one for the cleaning liquid and the other for the washing liquid. The cleaning and degreasing is done in three stages:

- spray-cleaning with C 153/80% demineralised water at 50° C
- spray-rinsing with C 153/80% demineralised water at 50° C
- circulating air drying at 80° C

3. To remove wax from parts for airplanes Tetrachloroethylene was replaced by a new cleaning-system uses a mixture of hydrocarbons (Shellsol D 7) and an alkali/water-based solvent. You need 6 stages to clean and dry the parts. The results are as good as wanted. The stages are:

- pre-treatment with citywater at 96° C
- cleaning with Shellsol D 7 at 75° C
- cleaning with an alkali/water-based solvent at 62° C
- rinsing with demineralised water at 60° C
- rinsing with dem. water at 80° C
- drying at 100 ° C

The process stages of treatment with HCS correspond to those for CHC's. There is a difference in that the drying is more problematic when HCS is used. Due to the relative non-volatility of the solvent, only forced hot air drying can achieve good results. Furthermore the inflammability of HCS must be taken into account during cleaning with heated solvent, during steam degreasing and during hot air drying.

A new possibility for substitution with vegetable oil esters in diverse application sectors is explored. It is to be expected that besides the HCS and water-based cleaning systems further alternative systems will be available.

(4) Water-Based Cleaners

In contrast to CHC's, water-based processes rely to large extent on the mechanical washing element for their cleaning performance. A difference is made between single-chamber spray systems and continuous flow systems which work according to an immersion and/or spraying process. The workpiece is vigorously moved in the presence of the watery cleaner. In some machines the cleaning solution is additionally flushed against the workpiece under pressure.

Continuous flow systems consist of the cleaning zones washing, rinsing, passivation, and drying. Circulating air drying accounts for least one third of the total energy consumption of water-based systems.

The water-based cleaners do not have the universal applicability of CHC cleaners. Therefore you need customised cleaning recipes.

(5) Some Examples of Water-Based Cleaning Systems

1. The cleaning system of optical workpieces (lenses etc.) can be replaced by the following water-based system:

- -cleaning with neutral cleaner using ultrasound
- -rinsing with water
- -cleaning with neutral cleaner using ultrasound
- -rinsing with water
- -cleaning with silicon-based tensides to keep the water away from the surface
- -rinsing with demineralised water
- -drying with circulating air (50° C)
- -drying with circulating air (50° C)

2. Metal workpieces made by lathes can be generally cleaned by the following water-based 4-zone-system:

- -cleaning with a water-based cleaner using ultrasound (the cleaner contends tensides) temperature 25° C
- -rinsing with water; t = 25 ° C
- -passivation with phosphates: t = 25 ° C
- -drying with circulating hot air

3. In **coating systems for cars** the overspray remaining on the skids and grates have to be decoated from time to time. In the past, the cleaning was done by using Dichloromethane. The cleaning system was changed by using hot Sulfuric Acid. For decoating also aluminium workpieces the "Acid-system" was not applicable.The system was changed once again for the use of water under high pressure.

4. The extraction of contents of foods was often done by using Dichloromethane. That was also done to extract caffeine to produce decaffeinated coffee or tea. The alternative was to use overcritical CO_2.

(6) Dry-Cleaning

In Germany there are to alternatives to Tetrachloroethylene (PER) in the field of dry-cleaning in work - non-halogenated hydrocarbon solvents (HCS) and water-based solvents.

HCS machines work in a similar way to PER machines. Compared to PER, HCS has a much lower volatility and environment relevance, so it is possible to separate the cleaning machine and the dryer. You have

- an increase in capacity to double or even more at about the same level of investment
- less wear (material fatigue due to frequent temperature changes)
- lower energy consumption

The cleaning efficiency is 85 % of PER.

It is estimated that 30 – 50 % of the articles of clothing currently cleaned in dry cleaning machines could also be washed in conventional washing machines in line with the care instructions on the labels. Today in Germany 15 % of the clothes are cleaned with HCS, 15 % with water-based solvents and the rest with PER.

Looking backwards, the German regulation concerning CHC was a great success in environmental policy and for the environment.

Since 1986 the consumption of CHC's for metal degreasing is decreasing in Germany!

- 1986 → 96.000 t
- 1987 → 67.150 t
- 1992 → 23.300 t

2.2.7. Results of Questionnaire

(Wolfgang HAFNER, Government of the Province of Carinthia, Dept 15 - Environment, Klagenfurt, Austria)

(1) Objectives

- Information / overview on current situation in MS and AS
- comparison with EU-regulations
- demonstration of differences

(2) Restrictions

- only 7MS and 8 AC, sometimes regions instead MS
- personal opinion & experiences of experts
- misunderstandings

(3) Return of Completed Questionnaires

Countries	Responsible persons
Austria	Wilhelm Muchitsch
Cyprus	Georghiades Stelios
Czech Republic	Yvonna Hlinova
Estonia	Aare Sirendi
Germany	Norbert Schieß
Hungary	Tamas Lotz
Ireland	Marie O'Connor
Italy	Daris Fulvio
Latvia	Sile Mara
Lithuania	Masilevicius Rolandas
Portugal	Graca Bravo
Slovak Republic	Daniel Geisbacher
Slovenia	Matjaz Nemanic
Sweden	Inga Birgitta Larsson
United Kingdom	Peter Newman

(4) Legal Background

- What national laws and regulations exist in your country governing the use of chlorinated hydrocarbons (CHC) in industrial plants (including contaminated sites) with a CHC consumption of more than 1 ton per year
- in all MS and AC (except Cyprus):
- laws, acts, ordinances for new and existing plants
- any (most) changes require an authorization
- a kind of EIA

(5) Authorities and Legal Bodies

- Which authorities/institutions are competent ...
- Local :
- Regional : LT, P
- Regional & Local : A, CS, EE, D,
- Regional & National: H, LV, SL, UK

- National: IR
- National & Local: SI
- National & Regional & Local: S

(6) Prohibition of CHCs

- From 1991 in most MS and AC
  Tetrachloromethane & 1,1,1-Trichloroethane is prohibited
- additionally in Sweden
  - Dichloromethane since 1995
  - Trichloroethylene since 1993
  - Tetrachloroethylene since 1993 (for household use)
  - Carbontetrachloride since 1993

(7) Air Emission Limit Values

- a) Which air emission limit values apply for the use of chlorinated hydrocarbons in industrial plants?
- Mostly between 20 - 150 mg/m3
  as hhav or dav
- ILV (Imission limit values)- regulation in LT and LV
  - 0,06 mg/m3 PER dav
  - 0,5 mg/m3 PER hhav
- c) Are the fugitive emissions considered?
- Different answers and approaches
  - encapsulated plants
  - immision values
  - nothing

(8) Waste Water Emission Limit Values

- a) Which water emission limit values apply for the use of chlorinated hydrocarbons in industrial plants
- differences between 0,1 and 10 mg/l
  as CHC, AOX or POX
- discharge limits in SI and I
  2,5g/t 5 g/t 20g/t
- UK 2,5 t/a CHC

(9) Measures to Prevent Contamination of Soil or Groundwater

- a) Which measures are applied?
- different state-of-the-art
- collection devices and leak detection systems are usual
- enclosed plants
  - generally only in A, D
- b) Are there any threshold values for soil or groundwater contamination?
- Soil concentration
  - different approaches and limit values
  - 1 - 400 mg/kg, 10mg/m3
- Groundwater concentration
  - no regulation
  - limits for drinking water
  - 1-20 ug/m3 in SL

(10) Measures to Avoid Fugitive (=diffuse, uncaptured) Emissions

- a) Which measures are applied?
- b) Which methods of estimation and / or calculation of fugitive emissions are applied?
- quite different approaches:
  - from nothing to enclosed plants
  - from no calculation to solvent management plan

(11)Best Available Technology (BAT)

- Not very satisfying answers
- different interpretation of the meaning of BAT

(12) Cleaner Production

- Most countries undertake efforts to promote substitution
- good example of Sweden
  - substitution programme in cooperation with industry

(13) Legal Consequences for Non-Compliance

	Yes	No	Euro	Others
Austria			up to 2180 Euro	
Cyprus	yes		max. 3500 Euro	upto two years imprisonment, or both penalties together
Czech Republic	yes		approximately 0 – 280.000 Euro	enclosing plants
Estonia				
Germany, Saxony	yes		50.000 Euro highest *)	
Hungary			About 1 Euro/kg	
Ireland	yes		0 – 1.000.000 Euro	
Italy	yes		5000 – 100.000 Euro	Under arrest (From 6 Month to 3 Years)
Latvia	yes		Not over 250 Euro	
Lithuania	yes			
Portugal	yes		249.999 – 2.493.989 Euro	
Slovak Republic	yes		100 – 25.000 Euro	
Slovenia				
Sweden	-			
United Kingdom	yes		0 – 33.000 Euro	Plus up to 2 years in prison

(14) Conclusion

- All countries are aware of CHC-problems
- regulations, approaches and state-of-the-art are quite different particularly concerning
- fugitive emissions
- prevention of soil&groundwater pollution
- remediation of contaminated sites
- substitution

2.3. National Case - Studies

2.3.1. Italy: Groundwater Contamination from Chlorinated Solvents in the North East Region of Italy

(Alberto CARNIEL, ARPA Friuli Venezia Giulia, Dipartimento Provincinciale di Pordenone, Italy)

Twelve years ago controls of Fontanafredda aqueduct water leaded to find a impressive contamination from tetrachloroethylene (PCE) of the freatic aquifer affecting the potability of thousands of private wells too.

Hydrogeological studies with drilling of many monitoring wells have been able to find the source of the pollution from a middle sized factory (150 workers) for aluminium serygraphy which used large quantities of PCE and 111 trichloroethane . In the soil under solvent tanks at the depth of 7 m large PCE presence has been found, up to 12 g/Kg .

The examined area lies in the friulan plain west of the Tagliamento river and whose boundaries are the Livenza river westside and the cellina-meduna system eastside .

Plain settlements had fluvioglacial and alluvial origin timing from the quaternary and consist mainly of pebble stones and gravel with thickness of hundreds of meter with somewhere inserts of sand, silts and clay ending in the southern side with the “risorgive” line .

The settlement with a area of 460 Km^2 , volume of about 100 Km^3 and permeability values ranging from 10^{-3} to 10^{-4} m/s hosts a freatic aquifer of about 2,5 billions of m^3 flowing from north to south at relatively high speed.

The heavily PCE (more than 30 ug/L) contaminated zone is relatively small with 14 Km^2 and a maximum width of about 1 Km , resulting from coincidence of the flow of pollutants with the axis of the aquifer’s piezometric draining.

The highest PCE values in the phreatic aquifer have been found in the monitoring well N 7 , 200 m from the factory with concentrations up to 9.000 ug/L in the first years and now still reaching some thousands of ug/L PCE .

Head space gas chromatografic analysis together with tetrachloroethilene (PCE) pointed out presence of little traces of 111 trichloroethane and trichloroethilene (TCE). The concentration of TCE has been growing from the first monitoring wells near the factory to the farest one near the “risorgive” line with values of the ratio PCE/TCE ranging from about 50 in the first well to less than 10 in the farest one .

In the lowest interested zone near the “risorgive” line the PCE values at the ex aqueduct well Forcate are diminishing from the maximum of about 600 ug/L in the 1988 year to about 100 ug/L in the present time.

In the surface layer at the border of the factory , the weak water table at 6/7 m deep showed PCE concentrations up to 80.000 ug/L .

The next investigation program is focused in the monitoring of the several private wells in the lowest zone under the “risorgive” line where the aquifer speed is very slow ,to verify if pollution because of these alleged delay in its diffusion , is now increasing and if solvents contamination is reaching wells which before had been found exempt .

2.3.2. Austria: Investigation and Remediation of CHC-Contaminated Sites in the Province of Upper Austria – Experiences on Problems and Solutions

(Dietmar MUELLER, Austrian Federal Environmental Agency, Vienna, Austria)

Due to the widespread application of chlorinated solvents within commercial or industrial processes and the start of the implementation of the Austrian Water Monitoring System a couple of groundwater contamination problems had been detected in the early 1990ies. Referring to four cases of groundwater contamination in Upper Austria some experiences on technical aspects, feasible solutions and limitations within investigation, assessment and remediation could be identified. Two cases of soil and groundwater contamination caused by the use of chlorinated solvents for degreasing processes at metal fabrication enterprises may show up limits, obstacles and chances to clean up sites polluted by chlorinated hydrocarbons effectively.

In 1989 an investigation of the gaseous phase of the unsaturated zone of the underground at an enterprise for agricultural machines showed a soil contamination. The detected contaminants had been numerous chlorinated solvents mainly PCE (Tetrachloroethene) TCE (Trichloroethene) and TCA. Some remediation measures had been implemented within a short time but also had been dropped some months later as no positive effects appeared. In 1991 and 1993 additional investigations took place and finally in 1994 the contamination was reported to federal authorities. All the time the main interest of the polluter had been to minimise costs. As his consultants gave the way to it a lot of the investigations and the sampling within the first five years had been insufficient or not appropriate. So there was no certainty about the primary sources and the affected area, the intensity of contamination nor the geological situation. Therefore a fourth investigation phase became necessary to complete the so called "three-dimensional contamination model" and finally it became clear that an area of 10.000 m^2 is contaminated. At the source CHC-concentrations up to a maximum of 1.700 µg/l, with high percentages of degradation products especially 1,2-Dichloroethene and Vinylchlorid, could be measured. The actually known groundwater contamination had been detected to a length of 500 m affecting some private wells.

But at this point the stakeholder dropped co-operation totally and signalised that he had lost confidence in technical consultants and was not willing to pay on. According to this viewpoint the polluter began to appeal against authoritative orders. The legal procedure is still not finished. Irrespective of the legal situation it was possible to introduce a small pilot project for passive remediation of the groundwater by a "funnel-and-gate"-system. This pilot project is financed by an interested company and a public research funding. A comprehensive remediation project is still missing. The history of this case shows that a couple of negative prerequisites like a complex geological situation, a mixture of contaminants, missing know-how of technicians, inappropriate investigations and defensive viewpoint of the stakeholder can bring about a growing problem and leave a no-win situation without possibilities for an effective solution within decades.

Four years later in 1993 some groundwater samples nearby a furniture producing enterprise showed high amounts of dissolved TCA (1,1,1-Trichloroethane). At the source concentrations up to a maximum of 1.400 µg/l could be measured. Further investigations showed an intensive soil contamination of the unsaturated zone at the source at an area of 3.000 m^2. The groundwater contamination had been detected to a length of 1.000 m affecting a couple of private wells. The contamination was urgently reported to the federal authorities and within six months the first remediation measures could be implemented. Another three years later the active remediation came to an end and the aftercare by monitoring had been stopped in 1997. From the start of investigation the permanent effort was to optimise the project. Therefore the timeframe and the costs of the remediation had been successfully minimised and it took 3 years instead of 6 years and 0,7 million Euro instead of 1,1 millions Euro. Complementary aspects for this effective remediation have been the active and offensive role of the stakeholder, an optimum of collaboration between all participating private parties and authorities, simple geological conditions corresponding to available and appropriate techniques as well as an state of the art performance of the project team.

2.3.3. Germany: Surface Cleaning System in a Factory for Watches („Glashütte“)

(Norbert SCHIESS, Government of Saxony, Ministry of Environment and Agriculture, Dresden, Germany)

General

The production of watches made in Glashütte needs a lot of metal pieces, because the watches are completely mechanical. Therefore the different workpieces must be cleaned and degreased after the production.

On account of its excellent cleaning and degreasing characteristics Glashütte was a typical CHC-user.

Old installation

To clean the workpieces, Glashütte used a cleaning machine like shown in the first chart.

There are 3 treating-stages situated in the lower part of the cleaning machine. Three combined chambers are filled with liquid Trichloroethylene and the workpieces passed one after the other chamber. In the third chamber the CHC was very proper (rinsing-part).

In the bottom of the cleaning machine the dirty CHC was cleaned up by destillation. The destillation waste could be put out of the machine. The temperature of the cleaning CHC was about 90° C.

In the top of the cleaning machine was a water cooling system to eliminate CHC-vapour. It was a semi-closed system. The workpieces must be put in by hand. If the worker opened the lid, the waste air exhauster started. The consumption of Trichloroethylene was 50 to 100 kg/month.

At the end of 1994 the use of such an old installation was only allowed, if the following standards are guaranteed:

- closed system during the cleaning process, except the waste air exhauster
- before the unloading the concentration of CHC must be similar or below 1 g/m³
- there must be a security system which don’t allow to open the machine if the concentration of CHC is more than 1 g/m³. The gas concentration must be continuously detected.
- the emission limit in the waste gas is 20 mg/m³; this is only possible by using activated carbon filters.

Therefore the old cleaning machine was set out of work in 1994 and a new, water-based cleaning and degreasing system was installed.

New installation

Is a 6-chamber system. The workpieces will be put into stainless steel cages and afterwards into the cleaning chambers by hand.

Cleaning solvents are water-based Sodiummetasilicat and Phosphates (Galvex 93) and 2-Propanol and Ammonia (Galvex 17.30 SU). Each solvent is combined with tensides.

The cleaning-temperature is very low. Therefore there is no vapor building mechanisem seen.

The main reason to use alternatives was the tough German regulation for CHC’s. Otherwise the old cleaning machine would be still in work.

2.3.4. Ireland: CHC Reduction Using Cleaner Production Techniques in the Pharmaceutical Industry

(Marie O'CONNOR, Environmental Protection Agency (EPA), Regional Inspectorate Cork, Ireland)

Abstract

Bulk chemical manufacturing and tabletting plants of major pharmaceutical companies are located in Ireland. Historically, these companies used large volumes of chlorinated solvents in the processes. With the pressures of legislation and subsequent cost of both the raw material and disposal of waste a significant effort has been expended to develop CHC free processes. Where this has not been possible solvent recovery systems are installed. One of the most significant changes has been in the tabletting area where aqueous based systems are now being used instead of CHC's such as dichloromethane. Due to the process of obtaining approval from USFDA and Medicines boards progress can be slow but many now see the benefits both from an environmental and cost base.

(1) General

The Environmental Protection Agency (EPA) have been the body responsible for the licensing and control of large industry in Ireland since 1994. The first sector to be licensed was the Pharmaceutical Industry. The manufacture of pharmaceutical intermediates and the production of tablets historically involved the use of large volumes of chlorinated solvents particularly dichloromethane and chloroform. Over the last four years the Agency has seen the companies implement many changes resulting in a sharp decline in their use.

The pharmaceutical sector is regulated by several other authorities with the following being two of note in the context of this presentation:

- Medicines Boards
- USFDA

The process of drug manufacture from research onwards is tightly controlled for the protection of the consumer. Due to problems in the past where the use of a different solvent resulted in side products being formed which had severe consequences for the patient, changes to manufacturing practice are slow and expensive.

However, it is recognised by the industry that there is a need to reduce emissions of CHC's and where possible eliminate their use.

(2) Hierarchy of Pollution Control

The EPA approach is to adopt the following hierachy

- Process design/redesign to eliminate emissions
- Substitution of materials/solvent
- Waste minimisation by process control, inventory control and end-of-pipe technology.

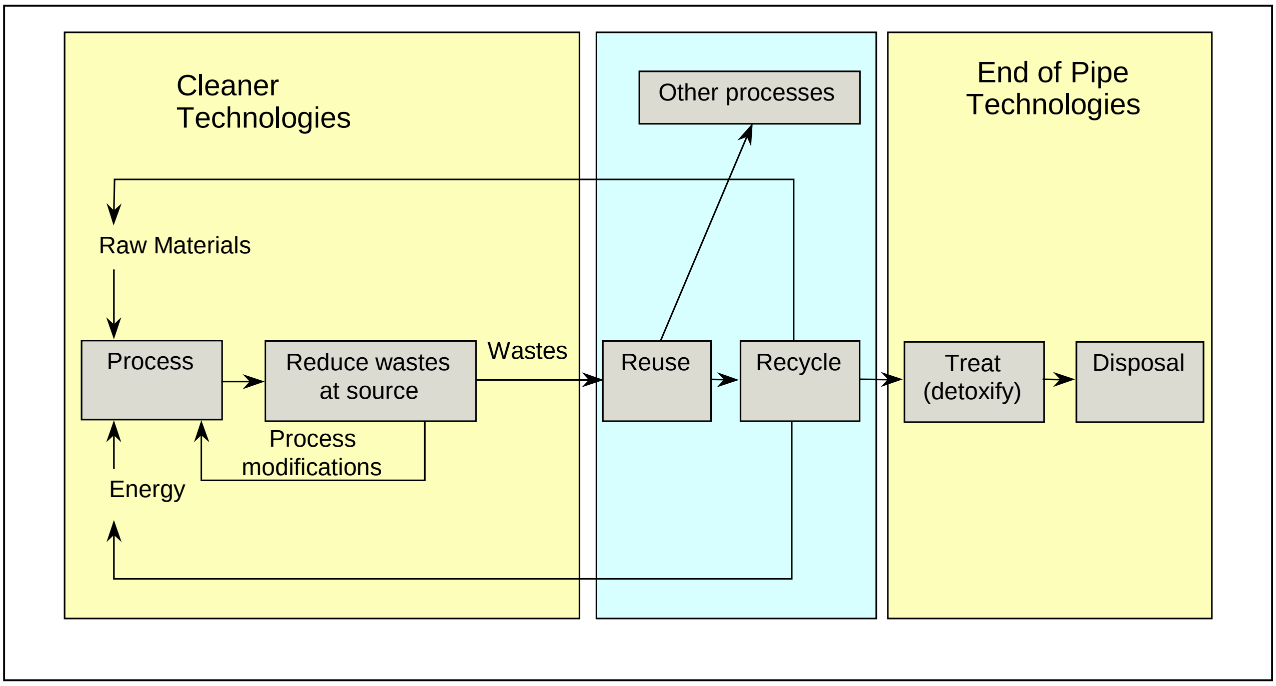


***Figure 2.3.4-1**: Hierarchy of Pollution Control – Agency Approach*

(3) What is Cleaner Production?

'' any new or modified production process resulting in the generation of less waste and/or the use of less energy''

The use of abatement is not seen as <u>true</u> Cleaner Production as it does not result in the generation of less waste.

(4) IPC Licence

The Agency has issued licenses using the Integrated Pollution Control (IPC) approach. Licence conditions contain the following elements among others:

- Emission Limit Values
- Pollution Emission Register
- Environmental Management Programme (EMP)
- Fugitive Emission Studies

The Pollution Emission Register (PER) is a register of potentially harmful substances used and released from the site. The companies are required to agree a number of substances for indepth study to determine the quantities released on an annual basis. As this information is available to the public it provides a major incentive for emission reduction programmes.

(5) Two Examples

<u>(5.1) Pharma A – Manufacture of Tablets – usage of Dichloromethane ~150 tonnes/annum</u>

- 1996 DCM emissions to atmosphere ~20 tonnes
- 1999 DCM emissions to atmosphere ~1tonne

This was achieved by

- move to aqueous based coating where feasible
- Reductions in fugitive emissions through
- Introduction of Cleaning-in-place (CIP) equipment
- Use of fluidised bed technology with solvent recovery
- Improved plant maintenance/leak detection

(5.2) Pharma B – Bulk Pharmaceutical Intermediate - usage DCM ~ 50 tonnes/annum

The total solvent usage on this site is approximately 125 tonnes/annum. In 1997 the PER indicated estimated losses of 6%. The Agency then required the company to provide an indepth Fugitive Emissions Study which was carried out over two years. A brief summary of the results are shown below:

1998 – Fugitive Emissions Study

- Approx. 1 tonne VOC(0.8% total usage)/annum was being lost through
- Storage tank losses (VOC – 0.33%) (DCM – 0.08%)
- Building Ventilation (VOC – 0.036%) (DCM – 0.012%)
- WWTP (VOC – 0.43%) (DCM – 0.03%)

1999 – Fugitive Emissions Study

83% of all the process components (387 valves, flanges etc) were screened – USEPA method.

- 83% leaked <1ppm
- 40% leaked <20ppm
- Total losses from these components was 0.002% VOC

Following on from these studies the company proposed a number of projects in their Environmental Management Programme (EMP)

- Installation of new valves to minimise tank losses
- Evaluation of discharges to the waste water treatment plant (WWTP) to eliminate streams where possible.

(6) Changes Noted 1996 to 1999

In using this approach the Agency has noted a decrease in solvent usage on some sites but in particular a more responsible attitude to the CHC issue. Just to summarise

- Attitude to solvent usage particularly CHC's is changing with more emphasis on cleaner technology at the R&D stage of the projects.
- Elimination of chloroform and DCM from new processes planned for 2000 +
- Abatement no longer seen as the *FIRST* answer
- Improvements in process equipment with more emphasis on minimisation of solvent losses.
- Research on aqueous based systems producing positive results

2.3.5. Slovenia: Substitution of Ozone Depleting Substances (ODS) in Slovenian Industrial Plants

(Matjaž NEMANIČ, Slovenian Ministry of Environment and Spatial Planning, Ljubljana, Slovenia)

(1) Abstract

During past decade Slovenia has undergone through political and economical changes which has a consequence on changed environmental and industrial issues. Higher environmental consciousness resulted in adoption of many international agreements and protocols. Slovenia ratified Montreal Protocol and its amendments as one of the most important global prevention pollution acts. New environmental approaches of the Slovenian government faced industry in the country with inevitable upcoming changes in technology of metal degreasing, electronics production, dry cleaning and some other industrial fields. State governed ODS Phase Out Program was founded and many different companies from various industrial fields joined the program. The program proved that in 1992 nearly 90 % of CHC solvents and some CFC substances were used in metal degreasing and electronics industry. This national case study will present four different companies (electronics, chemical industry, car industry) their approaches, experiences and solutions in the field of substitution of Ozone depleting CHC solvents. For the scope of the workshop the focus is on particular CHC solvents which were successfully replaced with other Ozone friendly solvents or their use was abandoned and technology of production completely changed. By 1996 vast majority of Ozone depleting CHC solvents in Slovenia were phased out of industrial use.

(2) Background

(2.1) introduction

This study will not go deep into governmental actions or backgrounds of organisational support of the **National program for the phase out of ODS** which was one of the most successful environmental programs in the country in the past decade. Emphasise will be more on the industrial view of the Program in a way to represent their approaches, experiences and solutions in the field of substitution of Ozone depleting CHC solvents. During past decade Slovenia has undergone through political and economical changes which has a consequence on changed environmental and industrial issues. Higher environmental consciousness resulted in adoption of many international agreements and protocols. Slovenia ratified Montreal Protocol and its amendments as one of the most important global pollution prevention acts. New environmental approaches of the Slovenian government faced industry in the country with inevitable upcoming changes in the next industrial sectors:

- Refrigeration
- Aerosols
- Foams
- Fire extinguishers
- Solvents (Industrial use)
  1. Metal degreasing
  2. Electronics
  3. Dry cleaning
  4. Others (adhesives, varnishes, rubber engineered products, plastics products…)

(2.2) National Program

Due to the Protocol's clear deadlines State governed ODS Phase Out Program was founded and many different companies from various industrial fields joined the program. Program was divided into different sectors, due to the various phase out problems of specific sector: Refrigeration, Aerosols, Foams, Fire extinguishers and Solvents - Industrial use (metal degreasing, electronics, dry cleaning and others). For the scope of the workshop the focus is on use of CHC solvents which were successfully replaced with other Ozone friendly solvents or their use was abandoned and technology of production completely changed. The program proved that in 1992 nearly 80 % of CHC solvents and some CFC substances were used in metal degreasing and electronics industry.

(2.3) Sector of CHC Solvents Industrial Use

The weakest point of a National phase out program of ODS was fragmented sector of Solvents, due to its wide spread industrial use from one to several ten tones of solvents. Mainly 1,1,1-trichloroethane was used in 95%.

The use of ODS industrial solvent was greatly dispersed in metal degreasing application sector among 150 different users. In dry cleaning 97% of ODS consumption was attributed to 4 consumers, while in electronics 3 major consumers presented 72% and in other applications 81% of ODS consumption was attributed to 4 firms.

As consequence of all mentioned facts from industrial use of solvents sector collection of data was slow and level of knowledge in small private enterprises relatively poor.

On the other hand there were also some other companies which were and still are among leading companies in their branch and their management was already in the beginning of 90'ies highly ecological aware.

3. INDUSTRY- Cases of SUCCESSFUL phase out of ozone depleting CHC Solvents

This national case study will present three different companies from various industrial sectors:

- Car industry - REVOZ/RENAULT
- Electronics - ISKRA EMECO
- Others: Rubber and Chemical industry - SAVA

(3.1) REVOZ/RENAULT

One of the RENAULT's eight car assembling plants in Europe, with continuos production from 1954 and production rate 450 vehicles /day, 90% of those for export.

Use of CHC solvents: TRICHLOROETHYLENE

METAL DEGREASING:

- Degreasing of axle parts before electric arc welding:
  Process was realised with 1600 l of solvent in a closed immersion system with regeneration unit.
- Rude cleaning of carrosseries before degreasing
  Carrosseries were wiped manually by 5% solution of CHC solvents and it was spent daily 20 l.

SOLUTION:

Change in production technology leaded to end of use of CHC solvents in 1992. In the year 1991 production of welded axles was stopped and replaced by the production of cast constructed axles and forged pieces CHC solvents for carrosseries cleaning were successfully replaced by improved water degreasing agents.

(3.2) SAVA Rubber and Chemical Industry

It is the biggest Slovenian tires and rubber engineered products producer. They also produce adhesives and artificial leather. Use of CHC solvents: DICHLOROMETHANE, TRICHLOROETHYLENE, TETRACHLOROETHYLENE AND 1,1,1-TRICHLOROETHANE with Consumption 23 t/y (1992). For the best overview of different production use of 1,1,1-trichloroethane is observed in each processing division separately:

ADHESIVES

1,1,1-trichloroethane was used as a raw material for production low flammable adhesives.

rubber engineered products

Production of rubber engineered products demand 1,1,1-trichloroethane as a component in adhesives from the previous step and as a special bonding agent. Some metal parts in the process were also degreased by 1,1,1-trichloroethane.

ARTIFICIAL LEATHER

Because of the special production process of the artificial leather, CHC solvent was used for cleaning of the production hall floors. All mentioned processes including maintenance were using 1,1,1-trichloroethane for cleaning of the equipment.

SOLUTION:

Solution was hard to find, due to low flammable solvent was only technological acceptable but on the other hand carcinogenity, toxicity and ozone unfriendliness of some CHC solvents were unwanted characteristics. Trichloroethylene was temporarily replaced by 1,1,1-trichloroethane in the last 80'ies due to carcinogenity but solution had to be changed because of different Ozone policy. Final solutions made during the 90'ies are:

Adhesives

Dichloromethane and nonhalogenated solvents were introduced instead of 1,1,1-trichloroethane as a temporary solution.

Rubber engineered products

Changes in technological steps of rubber-metal parts production reduced degreasing by 50%. The rest of degreasing procedures are done by tetrachloroethylene.

ARTIFICIAL LEATHER

Water systems with special agents replaced use of 1,1,1-trichloroethane for cleaning of the production hall floors. In maintenance steam/hot water cleaning is used in cleaning equipment, when in other cases CHC solvents were completely replaced with acetone and white spirit.

(3.3) ISKRA EMECO

The basic activity of the company is production of induction and electronic electricity meters and systems for electric power production. Vast majority of the products is exported. Use of CHC solvents:

- 1,1,1-trichloroethane – Consumption 10 t/y (1992)
- CFC-113 (*not in the scope of the workshop, but it was also replaced)

CLEANING AND METAL DEGREASING

1,1,1-trichloroethane was used at manual cleaning of component parts, cleaning tools and certain parts of bearings. CFC-113 was used for cleaning of current coils, most parts of bearings and printed circuits after soldering.

SOLUTION:

Component parts

Component parts are cleaned now in two different ways:

- for emulsion washing parts is introduced water solution of the agent which is compatible with emulsion and does not involve any new special waste
- for oil washing parts is introduced a hydrocarbon based solvent which is after use burnt with waste oils

TOOL PARTS:

1,1,1-trichloroethane is replaced by cleaning in a biologically degradable detergent water systems.

CURRENT COILS:

Instead of ultrasonic cleaning multichamber with CFC–113, new cleaning line on the base of biologically degradable detergent with addition of copper anti-corrosion protection agent was built.

BEARING PARTS:

The definite replacement of ecologically hazardous solvents is done by a new multi-chamber equipment for semi-aqueous cleaning with biologically degradable detergent and drying in cyclical hydrocarbons.

PRINTED CIRCUITS:

Instead of CFC solvent, a new cleaning equipment on an alcohol base is in use. The replacement of two prohibited ODS in ISKRA EMECO company leaded to four different cleaning equipments, mainly involving aqueous cleaning. The problems of environmental protection, formerly reflected in harmful emissions of solvents into atmosphere are now focused on emissions into water, which are successfully solved with a new own waste water treatment plant.

(4) Results and conclusions

(4.1) Success National program and internal programs of companies

Even though that internal programs of companies succeeded and National program as well, there is no unique solution for substitution of ozone depleting solvents in Slovenia. During the initial stage 1,1,1-trichloroethane, which represented the major portion of consumption, was substituted with trichloroethylene, tetrachloroethylene and dichloromethane, even though that they are also environmentally hazardous. These are the optimum substitute solvents that can currently be used with relatively small changes in technology and process equipment. But still in the specific areas of industrial use of ozone depleting solvents, some different general phase out options were proposed :

(4.2) Different sectors (Solvent Industrial Use) phase out conclusions

Metal degreasing

Substitution of ozone depleting solvents by: trichloroethylene, tetrachloroethylene, water systems (biodegradable detergents), steam and vapor degreasing. Water degreasing systems are disadvantage due to introduction of heavy metals into water.

Electronics

Substitution of ozone depleting solvents by: tetrachloroethylene, alcohols, water systems (biodegradable detergents) with new technological procedures. Water degreasing systems in some processes do not meet technological demands of the process.

Other use (adhesives, varnishes, rubber engineered products, plastics products…)

The mode of usage in technological procedures and the products themselves produced great emission into the atmosphere. Emissions can be avoided with alternative solvents, closed systems and changes in technological procedures.

(4.3) General phase out options and conclusions

For any kind of industrial use substitute solvents which are still health and environmental hazardous is very important to follow technological process discipline and as much as it is technologically justified implement closed systems, cooling traps, additional carbon adsorption equipment and as final step internal and external recycling. Great consumers of ODS were and still are prevailingly export oriented and as such they had to comply with international standards for the market share race. Above mentioned companies successfully phased out ODS solvents on time due to their economical ability, ecological agility and with governmentally supported National program. By 1996 vast majority of Ozone depleting CHC solvents in Slovenia were phased out of industrial use.

2.3.6. Sweden: Phasing Out the Use of Ozone Depleting substances (ODS) in the Solvent Sector. Key Policy, Monetary, Technical and Cost Aspects of the Swedish Phase-Out (not presented on the workshop)

(Husamuddin AHMADZAI; Sweden)

This report addresses the successful phase-out of ozone depleting solvents in Sweden, the alternatives opted for by the industry and measures taken by the regulating and manufacturing sectors pertaining to the use of HCFCs and chlorinated solvents.

(1) BACKGROUND

Historically the problem of the depletion of the stratospheric global ozone layer has been in focus since the 1970's when the major role played by the CFCs (fully halogenated ChloroFluoroCarbons) in the depletion process was established. Concern for the protection of the ozone layer led to action whereby Sweden along with USA, Canada and Norway banned the use of CFCs in aerosol applications. Aerosol applications accounted for virtually half of the consumption of CFCs at that time. Sweden's prohibition on the manufacture and import of aerosols with CFC as a propellant became effective on the 1st of July 1979.

The discovery of the ozone hole over the Antarctic in the mid-eighties, however, led to the realisation that the problem was more acute than what some previous studies had indicated. Matters were aggravated by the fact that despite the knowledge of the detrimental effect of CFCs on the ozone layer and the ban imposed on aerosols, global CFC consumption had continued to increase and was in fact greater in 1986 than it had been 10 years ago. The major growth areas were the refrigeration, insulation and foam manufacturing, and the solvent sectors. In 1987 the Montreal Protocol was signed whereby a 50% reduction of CFCs by 1998 was prescribed. The use of Halons was to be frozen at the 1986 year level. Since the signing of the Protocol in 1987, additional ozone depleting substances (ODS) have been encompassed by a number of amendments. Today virtually all the major ODSs are regulated.

(1.1) Phase-out of CFCs

In the historical context, the Swedish Government not only ratified the Protocol but also pioneered by proposing an ambitious CFC phase-out programme for the domestic CFC market. A Proposal (Prop.1987/88:85) was adopted by the Swedish Parliament in May 1988 and an Ordinance (1988:716) was subsequently issued legislating a phase-out of ozone depleting substances identified in the Montreal Protocol. The Ordinance came into force on the 1st of January 1989 and ordained a plan calling for a 50% reduction of the CFCs by January 1, 1991 and a virtually complete phase-out in all application areas by January 1, 1995. The plan went well beyond the targets laid down in the Montreal Protocol.

The Swedish CFC phase-out schedule encompasses eight major application areas. The schedule was staggered as depicted in **Table 2.3.6-1**. The phase-out of Halons was mandated to take place by 31 December 1997. A hallmark of the Swedish regulation was that regulation controlled the use of ODS. For the solvent sector, the ODSs of concern were mainly the following:

- CFC-113
- 1,1,1-trichloroethane
- Carbon tetrachloride (CTC)
- HCFC (mainly HCFC-225, HCFC-141, HCFC-123 etc)

Table 2.3.6-1*: The Swedish Phase-out Schedule for CFC and their Mixtures in the Solvent Sector. For the case of the Solvent Sector, the Phase-out Dates* for Ozone Depleting Substances includes Carbon Tetrachloride (CTC), HCFCs and 1,1,1-trichloroethane.*

Area of Application	Phase-out Deadline
Aerosols (CFCs)	1989-01-01
Sterilisation (CFCs)	1989-01-01
Solvents:	
Cleaning and Degreasing	
(except dry-cleaning, CFCs)	1991-01-01

Area of Application	Phase-out Deadline
Dry cleaning (CFCs)	1995-01-01
All Other Uses (CFCs)	1989-01-01
Carbon Tetrachloride (all uses)	1993-11-01
1,1,1-trichloroethane (all uses)	1995-01-01
HCFC (all uses)	1994-01-01

***Note*:** Phase-out date means that it became illegal to use a specified chemical beyond the date unless one has been granted an exemption.

(1.2) Phase-out of 1,1,1-trichloroethane and Carbon Tetrachloride

Background material in the form of consultant and ancillary reports had indicated that a phase-out of 1,1,1,-trichloroethane was also feasible. Alternative technology was already available for most applications and the large volumes in question. For certain small operations some difficulties were anticipated (e.g. mould release agents). The use of 1,1,1-trichloroethane and Carbon tetrachloride (CTC) as feedstock or solvent process agent was also envisaged to be difficult to replace. CTC is also cancerogenic and toxic. In 1992 ca 200 t was imported for use as feedstock (e.g. in the oil refineries, isomer production) and as solvent in e.g. in the chlor-alkali industry and laboratory analyses. About 50-100 t CTC is produced as a by-product in the production polyvinyl-chloride. This quantity is sent for destruction. The use of carbon tetrachloride in the solvent sector in Sweden was in general limited. Alternative technology for its use already existed or was under development. Pursuant to the Act of Chemical Products, carbon tetrachloride was to be phased out by 31 October 1993.

At the time the ban on the use of CFC-113, in 1991, the use of 1,1,1-trichloroethane in bulk form had in parallel been reduced by about 50 percent from approximately 2200 tonnes (1988) to approximately 1100 tonnes (1991). A relatively large quantity of 1,1,1-trichloroethane (1450 t) was also found in chemical products used by the industry and consumers. To allow for a smooth transition, a five year respite was deemed sufficient for phasing out the use of 1,1,1-trichloroethane. The staggered approach allowed a transition without jeopardy to the CFC-phaseout. Pursuant to the Act of Chemical Products, all manufacture, import, sales and professional use of 1,1,1-trichloroethane, as such or in preparations, was legislated for a phase out by December 31, 1994.

(1.3) Measures to Restrain Use of HCFC

While a deliberated introduction of HCFC was expected to facilitate a smooth phase-out of CFC, an unlimited growth of HCFC would have defeated the very purpose of the CFC phase-out. The use of HCFCs has been discussed as an alternative to CFCs within virtually all sectors where CFCs are used.

In judging how the use of HCFCs is to be limited, the crucial factor is their use in a manner that catalyses a more rapid phase-out of CFCs world-wide. At the same time, other effects must also be taken into consideration, such as their Ozone Depletion Potential and the impact of the various alternatives on the greenhouse effect - directly or indirectly via an increase of energy consumption. For the solvent sector, the use of HCFC was deemed redundant as an alternative or as an intermediate because for virtually all uses, a non-ODS alternative was available. In this context, Sweden mandated that after 31 December 1993, HCFCs were to be banned in a number of use areas. The uses/sectors included e.g. aerosols, packaging and constructional materials, sterilisation and general solvent uses including cleaning and degreasing, drying, carrier media, process agent uses etc. In order to have the intended environmental effect, bans were combined with a ban on imports of equivalent products. (However, use for sterilization and cleaning/degreasing cannot be monitored).

It was generally considered that a ban would not have a major economic consequence, provided that it was enacted before a widespread use of HCFCs became established. Alternative chemicals were and are, in many cases, less expensive than the HCFCs. Since the alternatives are often flammable, however, and fire protection measures would be necessary. If these risks are taken into consideration during planning of production facilities and other units, however, the investments in fire protection measures can be considerably reduced.

(1.4) Phase-out of some alternative candidates in the solvent sector

In addition to the mandated phase out of ODS some non-ODS chlorinated solvents and surfactant additives are also targeted for phase-outs in Sweden due to their adverse impact on the environment. The current overall scenario can be summarised as follows:

- Phase out of CFC:
  - In general solvent applications (1991-01-01).
  - In dry-cleaning applications: (1995-01-01).
- Phase-out of carbon tetrachloride: (1993-11-01).
- Phase-out of 1,1,1-trichloroethane as of (1995-01-01)
- Phase-out of HCFC (1994-01-01)
- Phase-out of chlorinated solvents: Industrial use of methylene chloride and trichloroethylene by 1996-01-01. Use of methylene chloride, trichloroethylene and tetrachloroethylene (perchloroethylene) by public in consumer products by 1993-01-01.
- Ninety (90) percent reduction of nonylphenoletoxylates (NPE) by the year 2000 in the engineering sector (base line 1990/91 ca 2400 tonnes/year (prop 1990/90:90)).

To ensure a satisfactory compliance, product quality, sound economy and environment for future production facilities, major projects were initiated in the Nordic countries. These projects had an active participation of the user industry, authorities and were co-ordinated by engineering and scientific researchers. The work was carried out by the independent technical institutions. Two of the larger inter-Nordic projects were

- the TRE-project for the electronics sector (Teknik för Ren Elektronik), and
- the AMY-project for the metal cleaning sector (Avfettning av MetallYtor).

The projects facilitated alternative solutions and technical support for the industrial users.

(2) POST-PHASE OUT SITUATION AND EVALUATION

Today we can look back at a very successful phase-out programme in Sweden. What the industry regarded as almost impossible to achieve when the decision was made in 1988, is viewed today as a closed chapter. A harmful group of ODS have been removed from widespread use in Sweden and without the need to close companies. Instead the phase-out of ozone-depleting substances (ODS) and the introduction of new technologies have successfully been integrated with industry's ongoing research and development work. It has become part of the natural process of ensuring quality and improving production and efficiency and adapting to the needs of a sustainable society.The Swedish Environmental Protection Agency (SEPA) was commissioned by the Government to implement the programme in close co-operation with the industry.

(2.1) Combination of regulatory and economic instruments.

Strict and clear rules formed the basis of the general phase-out programme including that of the solvent sector. The key legislation in Sweden consists of a combination of regulatory and economic instruments. This combination was the result of major discussions and analysis.

(2.1.1) Target dates by area of use or sector

A clear decision by the Swedish Parliament mandated that ODSs were to be phased-out rapidly and completely. Key areas of usage were identified and swift negotiations with appropriate industry representatives followed. Dates were fixed by binding regulations after which the use of specified chemicals no longer was allowed in a given area of usage. Table 1 specifies those key dates. The dates were chosen for a quick action, with the knowledge that the majority of industries - but not all - should have a good chance to comply. For the slow movers there was a possibility of an individual exemption (see below). The benefits of the regulations were as follows:

- industry was at once alerted at top level,
- target dates meant a real challenge to the industry and initiated an intense process to adapt to new technologies, a process that probably not had been possible without those alarming targets
- it was made clear that the requirement was to completely stop the use of the substances, not just control them,
- it was made clear who was responsible for implementing, i.e. it is the ODS users, the manufacturers, service enterprises, and equipment owners which use ODS (not the party selling the substances, or the authorities)
- a swift change would be cheaper than a slow pace (exemptions, see below),
- failure to comply would lead to that the operation became illegal and must be closed, illegal use would result in heavy fines, maybe jail, and then probably closure of the operation,

- enforcement and supervision became quite easy and could be included in routine inspections by the already existing environmental organisation regionally and locally.

2.1.2 Exemptions - short period and at a high cost

The Swedish strategy was devised to allow for a narrow chance for an exemption from the set target dates. Exemptions qualified only after an application was submitted in an individual case and after judgement by the authorities according to set rules. Depending on type of substance and use, an exemption could be granted on the basis of “extraordinary circumstances” or “Special circumstances”. The applicant was mandated to describe in the application the planned action to phase-out the ODS and specify at what date he expects to be able to comply. An automatic exemption was never granted beforehand and the requirements on presenting a good action programme were quite high. An exemption - if granted - can only be valid for a set period of time, 6 month’s, 12 month’s etc.

There was a cost to the applicant just for applying for an exemption. The cost was regardless of the outcome (i.e. whether an exemption was granted or not). And if an exemption was granted the applicant had to pay a substantial fee per kilogram of solvent that was allowed to be used (cf. **Table 2.3.6-2**).

- The rationale for this economic instrument was:
- phase-out target dates did not need adaptation to those having most difficulty to phase-out the ODS
- phase-out plans in difficult operations could be scrutinised individually on their own merits
- it was up to the applicant to investigate and describe proposed action to comply, not the authorities,
- an exemption should give no competitive benefits to those who postpone adaptation to target dates,
- the administrative process is in line with the Swedish tradition of individual permits for operations that may be harmful to the environment.

This system with exemptions and fees was the outcome of a discussion on the possible use of economic instruments to achieve the phase-out of ODS. The result of that discussion was that it was judged that a system of taxes probably could not lead to a rapid and total phase-out due to difficulties to adapt the level of the tax to very different costs for phase-out in various operations. The Swedish experience from other environmental issues is that using economic instruments alone - e.g. environmentally motivated taxes - works well when the objective only is to reduce the use of a certain product but not to eliminate it completely within a given time. A general tax system also would result in a need of more administrative resources and give difficulties in enforcement. Furthermore, in order to maintain equity between Swedish manufacturers and their competitors abroad it would have been necessary to add a tax on imported products corresponding to the estimated amount of ODS used in the product, and to repay taxes on exported products - a fairly complicated system. Denmark has experience of such a system but uses it only as a complement to fixed phase-out dates. The Swedish experience is that the mix of regulatory and economic instruments chosen in Sweden combines the two worlds and enables the authorities to concentrate on the slow-movers.

At the end only about 70 exemptions were granted. The exemptions cover all the sector areas including the solvent sector. Currently 8 exemptions are still in force. The total quantities of chemicals that were exempted from phase-out at the general cut-off dates were just a fraction of the former overall use. For example, by August 1996, 15 exemptions were active. Quantitatively as follows: CFC approximately 10.7 tonnes, HCFC 10.9 tonnes, CTC 8 tonnes and 1,1,1-trichloroethane 0.3 tonnes. Almost all companies at the end thus succeeded to achieve their switch to alternative technologies before the set target date. The system worked very well.

Table 2.3.6-2*: Economic instruments used in Sweden for phasing-out ODS*

An exemption from phase-out dates may be granted for a given period of time and for an individual user, given certain conditions.

1) The fee for an application for an exempt is <u>2500 SEK </u>(approximately 300 US$). The fee had to be paid before the application could be considered.

2) Fee per kg ozone depleting substance (ODS) exempted:

Up to year 1994: 75 SEK/kg ODS (approximately10 US$/kg)

1995-1996: 300 SEK/kg ODS (approximately 40 US$/kg)

1997 and beyond: 600 SEK/kg ODS (approximately 80 US$/kg)

(2.1.3) Environmental permits.

Traditionally Sweden operates a system of individual permits for industries etc that may be harmful to the environment. Before construction or a plant or a modification to an existing one the operator must have an environmental permit. The permit contains the prescribed environmental requirements on the operation, emission limits, monitoring duties etc.

All permitting activity incorporated ODS regulation. Thus the restriction on use of the ODS was ensured in the Swedish permit system. This allowed control of any plans to build a new factory or modification of an existing plant that envisaged use of large quantities of ODS. Such plans could then be stopped or changed even before the general target date for that chemical. In practice the phase-out programme and our permit system meant an immediate stop to all plans for new factories in Sweden that were to use these chemicals.

(2.1.4) Import Restrictions

Sweden was one of the first countries in the world that carried out a systematic and total ban on ODS. The industry then had to invest in new technologies. To facilitate fair competition, import of products and formulations of ODS was disallowed. Otherwise there was apprehension that otherwise production would be abandoned in Sweden and moved abroad. That would lead to no benefit for the ozone layer. The customs was provided with a list on products and formulations to check and stop.

When Sweden later joined the European Union in 1995 the regulation had to be modified. Sweden the restricted the sale of such products, which, however, is much more difficult to effectively enforce and supervise. The problem is reduced over time as phase-out programmes proceed in other countries. Besides, Swedes are observant on environmental matters and there is a clear market reaction on products harmful to the environment. Competitors are as well observing each other. The problem of illegal use of products containing ODS is therefore almost self regulating. The potential market is limited, but the risk of severe market reactions is quite high.

(2.1.5) Requirements on handling ODS and equipment containing ODS.

In certain cases practices of handling ODS or existing ODS-containing equipment lead to quite large losses of ODS. For example e.g. open topped solvent degreasers. For such practices the Swedish EPA developed guidelines to minimise losses of ODS before the target dates were in force.

(2.1.6) Additional institutional instruments

Although regulatory and economic instruments formed the basis of the phase-out programme, complementary action was vital to actually make the programme work in practice.

(2.1.6.1) Information programme

- Many companies, organisations, regional and local authorities etc were involved and impacted by the phase-out programme. To adapt to the requirements they must know what the programme means and understand “Why”, “When” and “What” to enact to be able to proceed correctly and achieve success. In Sweden a massive information programme was launched which included:
- inviting authorities, organisations and companies to appoint contact persons to act as focal points for exchange of information,
- supplying contact persons with an ‘ODS-Handbook’ giving all relevant basic information and with a frequent update of the information,
- central and regional ODS-seminars to highlight current developments and for a dialogue on various issues,
- brochures and information packages adapted to the needs of various target groups, including industries, users, trade and the school-system,
- a continuos flow of reports on current aspects from SEPA that any interested party could subscribe to,
- access for anyone to world information on ODS and linked questions through the services of the library of SEPA which is the national Swedish focal point for environmental information.

(2.6.1.2) Training courses

Regional and local environmental officers have been regularly trained in what the regulations means and their duties in enforcement and supervision to ensure a competent and uniform action.

(2.6.1.3) Development and Demonstration programmes for the Solvent Sector

In certain sectors new technologies and solutions had to be developed and tried in actual service. The Governments general programme for support of technological developments and demonstration of new technologies were directed to cope also with the needs of the ODS-programme. This meant that universities and institutes were made available to help companies in problem-sectors and that government money partly could offset the risks to companies that volunteered as pioneers. Furthermore, industry co-operation was encouraged using small amounts of government money as “seed capital”.

Although the Swedish solvent sector in tonnage was rather small, the diversity of the Swedish industrial structure and application was as complex as any of the larger users of ODSs. Of the various ODS-use areas, the solvent sector is generally considered to be the most sophisticated, complex and diversified, e.g. by existence of a large number of small and medium size enterprises (SME). The major users in Sweden were the electronic, telecommunications, aerospace, defence and general engineering sub-sectors. The dry-cleaning sector was dominated by small shops in the cities, often run by single families with limited resources (hence a longer phase-out date for the dry cleaning sub-sector). Other uses were in the chemical process industry (chlor-alkali, rayon manufacture, laboratory testing etc).

The Swedish legislation called for the CFC solvent phase-out by Januray 1 1991 and was four years ahead of the total national phase-out of CFCs. The Swedish solvent phase-out was made even more complex by the restrictions on some alternative technologies, as listed above. To ensure a satisfactory compliance, product quality, sound economy and environment for future production facilities, major projects were initiated in co-operation with other Nordic countries. These projects had an active participation of the user industry, authorities and were co-ordinated by engineering and scientific researchers. The work was carried out by the independent technical institutions. Two of the larger inter-Nordic projects were

- TRE-project for the electronics sector (Teknik för Ren Elektronik), and
- AMY-project for the metal cleaning sector (Avfettning av MetallYtor).

Totally about US$ 3.5 million were spent on the two programmes. The programmes were initiated in 1988 and terminated in 1993. The projects facilitated alternative solutions and technical support for the industrial users. A unique hallmark of the programmes was to exclude the chemical and equipment supplier financing and rely only on industrial user, agency and institutional financing. This was at the explicit requirement of the user industry who felt they did not want to be steered in a particular direction by supplier financing.

For cleaning and degreasing other than dry cleaning, the phase-out plan’s timetable, with a ban from January 1, 1991, was particularly successful (>99.5% phase out). Only some exemptions have been granted, amounting to some hundreds of kilograms, mainly in the aerospace sector. By the end of 1995, a virtually 100% phase-out was achieved for both CFC-113 and 1,1,1-trichloroethane. For 1996 only 170 kg of ODS remained in the solvent sector in form of exemption, mainly in the defence applications. the end of 1995 There was no reported HCFC use in the solvent sector.

The use of CFC 113 for dry-cleaning decreased by about 30 percent mandated for 1-1-1991. Reduction was, however, mainly been achieved by a changeover to perchloroethylene. All CFC was successfully be phased out by 1995, and no exemptions were granted.

For the CTC use in chemical process industry, some exemptions (totalling about 1 ton for 1996) were granted to the chlor-alkali industry for a period of about 2-3 years while alternative processes were tested on a large industrial scale. The CTC phase-out is now complete in this sector also. Only exemption that remains today is a limited and small use of CFC-113 and CTC in laboratory use. About 300 laboratories used about 3 tons of CFC-113 and 3 tons of CTC during 1995.

(2.6.1.4) Supervision and Sanctions

It is vital that the phase-out programme is supervised down to company-level. Failure to act properly and illegal acts must be coped with immediately and firmly. There must be a real risk to be hit by severe sanctions when not in line with legislation. In Sweden we already had an environmental organisation we could use also for supervision of the phase-out programme.

However, the most efficient supervision, especially as regards smaller companies, was the check companies had on each other after a while for competitive reasons. Added a strong environmental awareness in the Swedish society and frequent market and consumer reactions to environmentally harmful products or behaviour, facilitated and only minor problems were experienced with companies trying to avoid requirements. Illegal ODS is a small problem in Sweden. There is just no market any longer.

(2.6.1.5) Overview, follow-up and rethinking

The central regulatory authority for the phase-out issues related to ODS is the Swedish Environmental Protection Agency (SEPA). Through various expert participation with industry, projects and international co-operation, the SEPA experts gradually got access to a multitude of information on the progress of the phase-out programme. We also obtained information from regional and local authorities, from environmental reports from companies, from a multitude of contacts with industry, from statistics on production, imports and exports etc. The data was compiled and analysed and annual reports were produced to give an overview of the situation. This exercise pointed out problem areas and allowed room for giving proposals for new actions and appropriate projects. These reports became the instrument to ensure that the overall goal of the phase-out programme was reached in time and in a sound and fair way. We had several discussions on our overall-strategy, changed details frequently, trying to rethink and analyse how to best proceed. This yearly process was very important and a key factor to keep the program efficient, vital and on track.

(2.6.1.6) SEPA staff

The SEPA national ODS-group had to deal with the whole spectra of questions: status of the ozone layer, environmental effects, key substances, a multitude of use in various industries etc, new technologies, economic analyses, statistics, negotiations with industry, training, information packages, forming of new strategies, legislation, international work etc. To build up this capacity in a very short time we developed a new and flexible ODS-organisation within the SEPA-organisation. A small central group acted as a leading secretariat. They worked together with key-specialists in a number of units in various divisions of SEPA, among those the specialist dealing with the same type of enterprises with regard to other environmental problems. In this way experts in various fields became directed towards the needs of the ODS-programme and became involved in the development of the programme and daily duties. We thus developed a flexible and very competent network inside SEPA that operated horizontally in the organisation, setting new routines for management and administration. In addition, we operated an external network of partners in industry, organisations authorities etc. This unorthodox organisation just managed to do a great job in a short time.

(3) TECHNOLOGIES FOR SOLVENT SECTOR

(3.1) Uses

The main ODS solvents in the solvent sector are, as mentioned above, CFC-113, 1,1,1-trichloroethane and CTC. In Sweden since HCFCs were banned in the solvent sector even before they became marketable never led to any major penetration. Historically, the primary uses of ODS-solvents are/(have been) in:

- dry-cleaning
- cleaning of electronics assemblies
- cleaning of precision/optical components
- cleaning of certain other metal components
- so called “process agent uses” e.g. as solvent media in the chemical process industry (CPI), e.g. the chlor-alkali industry, pharmaceutical industry etc.

To a lesser extent, ODS solvents have also been used for the following (non-exhaustive) purposes:

- drying of components
- carriage of special lubricants (bearer media for coating and impregnation)
- leak and crack detection for checking of e.g. fuel tanks, non destructive testing
- decontamination in the nuclear industry
- laboratory testing, e.g. evaluation of greases/mineral oils
- protection of the primary vapour in vapour phase soldering
- as a coolant in radars
- mould release agent carriage
- forensic finger print evaluation
- correction fluids
- specialised cleaning e.g. oxygen system cleaning, film cleaning, skin cleaning
- aircraft hydraulic system testing

- rain repellent systems

(3.2) Alternatives in the engineering sector

The primary alternative candidates for removal of contaminations in the engineering sector are:

- Aqueous formulations: Containing tensides (surfactants), complexing agents, dispersion chemicals, pH modifiers, solubility modifiers etc.
- Solvents In such systems, contaminants are solubilised in the cleaning agent. e.g. chlorinated/halogenated solvents, alcohols (e.g. IPA, ethanol), esters, ketones (e.g. acetone), terpenes, lactates (e.g. ethyl lactate), dearomatised hydrocarbons, glycols etc.
- Emulsions/micro emulsions Systems based on emulsification combine the principles of surfactant cleaning and solubilisation as with solvents. Emulsions usually consist of water, organic solvents and a surfactant. The organic phase is either dispersed in the aqueous phase or vice versa
- No clean systems: By careful up-stream process modification and quality control, avoid the necessity to clean, e.g. by use of volatile lubricants that leave only benign residue on a product.

(3.2.1) Conservation and Recovery

As a first step, conservatory practices are an important step to introduce clean technology measures. Solvent losses are often great in conventional or poorly maintained plants. In a poorly maintained plant only about 20 percent of the purchased solvent generally recovered. Conservatory measures can reduce CFC consumption by up to 90%, e.g. losses can be reduced from 2-5 kg/h-m2 of bath area with conventional practice to about 0.2-0.5 kg/h-m2 of bath area. For certain alcohol based and partially aqueous systems the overall rate of annual losses is around 0.03-0.05 5 kg/h-m2 of bath area.

(3.2.2) Use of ODS and Alternatives in the Electronic industry

The major use of ODS has been of CFC-113 in the electronic industry. Primarily in:

- Cleaning flux remnants on printed circuit board assemblies, followed by
- Use in open top batch vapour phase soldering equipment as a secondary sacrificial vapour blanket to minimise the losses of the expensive primary vapour phase used for reflowing solder pastes.

(3.2.2.1) Cleaning of Electronics

The increasing importance of manufacturing techniques using Surface Mount Technology (SMT) and mixed assembling methods posed a major challenge to all cleaning methods, including those based CFC-113 and 1,1,1-trichloroethane. While conservatory measures helped reduce solvent consumption in Sweden and facilitated reductions in some cases prior to the phase-out, the general Swedish phase-out of CFC-113 was affected largely by change to processing methods that allow assembly without subsequent cleaning, i.e. by so called “no-clean” technology. This has been accomplished by, e.g. by:

- Use of less active low solid fluxes, that do not require cleaning as they do not leave behind corrosive media on the assembly, and/or
- Use of inert gas blankets during the soldering step. Equipment enables applications under inert atmosphere for both, wave and reflow soldering. Inert blankets help in maintaining the activity of the fluxes and reduce oxide formations. Less oxide formation enables less active fluxes to be used whereby the post-soldering cleaning step can be made redundant. For assembling where a cleaning steps was necessary, however, resort has been be made to:
- Aqueous cleaning. Fluxes that can be cleaned in water. Such fluxes are usually highly active and therefore require removal to minimise post-assembly corrosion. Cleaning based on water does not pose problems in conventional through-hole mountings (stand-offs for component are in the range 250 - 375 microns), and water can easily penetrate and flush away impurities. Care needs to be taken though, on using aqueous cleaning for surface mounted and mixed assemblies. In surface mounted assemblies component stand-offs are smaller, <25 - 125 microns, and water may not easily penetrate and flush away impurities under the components. For such assemblies agitation and penetration can be achieved by
  -use of high pressure spraying (upper limit restricted only by component shearing, and static loadings problems),
  -use of surfactants/saponifiers (these are usually tensides, and pose little problem unless they

yield toxic nonylphenol),
-use of ultrasonic (subject to component tolerance), and
-a combination of the above.

- Alcohol/Alcohol Blend Cleaning. Alcohol, eg isopropanol, n-propanol, ethanol etc. and azeotropic blends, with water or with other organic compounds. Due to flammability reasons, safety aspects have to be catered for. Equipment that is safe to be used with flammable solvents is available. Such equipment, however, is more expensive than conventional equipment. Alcohol cleaning is already being applied, on an industrial scale, for mixed assemblies specifically designated for conformal coatings. Alcohols and acetone are also being applied for drying of intricate assemblies at a number of industrial installations.
- Emulsion based Cleaning has been implemented also. In-line, explosion-proofed, cleaning equipment is available on the market. Concern for disposal of concentrated solutions and rinse water equipment has been mitigated by use of equipment that enables self-contained recovery systems.
- Chlorinated Solvents i.e. 1,1,1-trichloroethane, perchloroethylene, trichloroethylene or methylene chloride, are fairly toxic and efficient degreasers but they have poor ionic contamination dissolving power. They are generally aggresive to light metals and synthetic polymers. Since chlorinated solvents are known to have an adverse impact on the environment, these solvents are targeted for phase-out in Sweden according to the time schedule mentioned in above. Strict emission controls can lead to low emissions. In general, chlorinated solvents cannot be recommended as viable alternatives unless strict and expensive controlled measures can be enforced.
- Other halogenated solvents (HCFC, HFC, HFE): New chemicals under development or being partially marketed include HCFC (HydroChloroFluoroCarbon) compounds such as HCFC-123, 141b, 142b, and 225b. HCFC compounds cause degradation of the stratospheric ozone layer, but to a lesser extent than the CFC compounds. The environmental impact of most new chemicals is not fully known. Since alternative cleaning methods are available for most applications, use of HCFCs in Sweden from 1993 onwards requires exemptions within the engineering industry. None have been granted till date. Also HFC (e.g. C5H2F10) and HFE (e.g. C4F9OCH3) type substances are being made available by vendors but their acceptance is yet rather limited partly due to higher costs and partly due to some global impact (global warming potential, GWP) nature of some of the alternatives.

(3.2.2.2) Batch vapour phase systems

With respect to alternatives to CFC-113 use in batch vapour phase soldering equipment, there are a number strategies:

- Eliminate the use of secondary vapour blanket. It is estimated that all other things being constant, production costs for the reflow operation would increase by a factor of 10 due to loss of the primary Perfluorocarbon (PFC, highly potent global warmer) vapour blanket. The joint quality, however, would not suffer. Vapour recovery units can recover up to 80% of primary vapours getting into the extraction system.
- Use of batch equipment designed to work without vapour blanket. Such equipment exists and has existed for many years. Additional equipment not requiring blanketing is also available.
- Use of substitute non-ozone depleting sacrificial vapour blanket e.g. another volatile PFC liquid (belonging to the same class of compounds as the primary liquids used in the vapour phase soldering equipment). PFC compounds have lifetimes in the region of 1000-50000 years and very high global warming potentials.
- Resort to alternative technology, e.g infra-red soldering.

(3.2.3) Use of ODS and Alternatives in Precision Cleaning

Materials cleaned in the context of precision cleaning are typically, inertial systems, gyroscopes, accelerometers, etc., and related gaskets, bearings, and housings: these may include new parts and a significant number of refurbished parts, hydraulic systems, miniature bearings, and disc-drives. CFC-113 and 1,1,1-trichloroethane have also been used in the context of optical equipment manufacture and maintenance, nuclear decontamination, aircraft maintenance, and the offshore oil industry.

The contemporary alternatives to the use of CFC-113 are basically biodegradable aqueous based systems, the non-chlorinated/non-halogenated organics, eg alcohols, ketones (acetone), emulsion systems, petroleum distillates and their various blends, chlorinated solvents etc. The alternatives may be applied via combination systems using ultrasonics, high pressure sprays, additives that modify the physical properties (tensides), and ancilliary equipment that render them safe according to the local regulations.

There is no single universal alternative for ODS-solvents. The main alternatives that have been applied in Sweden may be summarised as follows:

- Alkaline cleaning operating in conjunction with inhibitors - Oxygenated hydrocarbons based cleaning with and without additives (e.g ethanol, Isopropanol, “Industrial Spirit A” etc)
- Petroleum based hydrocarbons (e.g dearomatised HCs, napthenics etc)
- A combination of the above

(3.2.3.1) Aqueous cleaning (includes partially water-based/emulsion systems)

Generally, aqueous based cleaning system are considered to be the main alternatives to CFC and 1,1,1-trichloroethane.

Aqueous emulsion systems can be used for contaminants that are difficult to dissolve in water. Some of these water-based emulsions can consist of up to 20-25 percent tensides and 20-30 percent organic solvents. Another alternative is alkaline degreasing, where the degreasing bath consists of about 10 percent tensides and 10 percent alkali and complexing agents. Conversion to aqueous cleaning requires treatment and recycling of the waste water. This entails an initial capital expenditure for small companies without such facilities. One ball bearing manufacturer is utilising the SKF Washing Principle. This is a close loop system w.r.t. to the cleaning agent and applicable for mass production lines for cleaning of delicate surfaces. The system operates with an aqueous cleaner (2-5 percent “Careclean E88”) in conjunction a low content aromatic hydrocarbon (Castrol Rustilo DWX 88) as a dewatering media. The system is suitable for cleaning of delicate surfaces such as bearing or composite (metal/plastic/glass) components.

(3.2.3.2) Cleaning with organic solvents

Organic solvents such as alcohols, ketones, terpenes (e.g. d-limonene), esters and other organic compounds tend to be flammable. Conversion to flammable solvents requires investments to prevent fire and explosion. The problems can be overcome, however.

(3.2.3.3) Cleaning with other new chemicals. (HCFC/HFC/HFE)

The environmental impact of most new chemicals is not fully known. Since alternative cleaning methods are available for most applications, use of HCFCs from 1993 onwards requires exemptions within the engineering and electronics sectors in Sweden. None have been granted till date. PFC has been used to clean fluorineted lubricants and particulates effectively in combination with ultrasonics for removing particulate contaminants. Hydrocarbons are not removed effectively by PFC. Such contaminants may be precleaned in an aqueous alkaline cleaner, rinsed in demineralised water and drying in PFC vapours. Oxygen components can be cleaned thus. The major drawback is the high volatility of PFC, their extreme global warming potential and the costs associated with PFC compounds. Furthermore these substance are need to be controlled under the Kyoto Protocol. Aqueous cleaning followed by HCFC 141b and isopropanol blend has also been used for the same purpose but one major user found the combination impractical in existing equipment and that the volatility of HCFC 141b was even greater than that of the PFC (PF5060). Also HFC (e.g. C5H2F10) and HFE (e.g. C4F9OCH3) type substances are being made available by vendors but their acceptance is yet rather limited partly due to higher costs and partly due to global impact (global warming potential, GWP) nature of some of the alternatives.

(3.2.3.4) Cleaning with chlorinated organic solvents

These solvents are targeted for phase-out in Sweden according to the time schedule mentioned in Section 1 above. Regarding to emission controls, see Section xx. As an interim solution to ODCs, mechanical precision parts, including bearings used in the aerospace industry are being cleaned in small four sectioned watch cleaning machines. Better results have been achieved with bearings than with CFC-113. A combination of white spirits and glycolether along with a solution of trichloroethylene, methylene chloride and benzine are used in the four baths. Trichloroethylene is also being used in dewaxing operations but here again, alternatives are being pursued, e.g. hot wax; hot oil etc, lactate based systems.

(3.2.4) Drying of Components

Rapid drying of components in some application is a critical function. A number of technologies exist for drying, including:

- Centrifugal drying

- Cold/hot forced air/inert gas
- Infra-red lamps
- Vacuum drying
- Absorbent drying (e.g alcohol)
- Vapour phase displacement drying (HFC, HFE, perflourocarbon; alcohol, acetone etc)
- Oil displacement

(3.2.5) Chemical Process Industry, ODS Use and Alternatives Adapted in Sweden

Use of ODS in the processing industry mainly in the following applications:

- As a feedstock (e.g. in the production of other substances, e.g. as a chloride source in the oil refineries)
- As a solvent, mainly in the following industries:
  - Production of fine chemicals, pharmaceuticals and pesticides
  - Dye manufacturing
  - Manufacture of chlorinated rubbers
  - In the chlor-alkali industry (mainly to dissolve & contain explosive nitrogen trichloride)
  - In the manufacture of terephthaloyl dichloride (TDC)
  - Cleaning of silicon, purification of graphite
  - Processing of uranium
  - Extraction (decaffeination)
  - Manufacture of chlorinated parafins

Practically all the solvent applications in the chemical process industry have an alternative technology. In Sweden, the main use of ODS in the chemical process industry was that of CTC and 1,1,1-trichloroethane. In refinery operations, CTC and 1,1,1-trichloroethane were used as a source for chloride. The alternative in the refineries was use of tetrachloroethane (perchloroethylene) without any additional capital or operating costs. The same equipment has been used with success and with a lower price for perchloroethylene, operating costs have been reduced by 40 percent. About 120 tonnes of perchloroethylene is used for a refinery with a capacity of 10 million ton/y.

In the chlor-alkali industry in Sweden, in-house solutions have been incorporated as each plant has unique processes and co-products. For example, at one plant no alternative chemical is used to dissolve the highly explosive NCl3 which necessitated the use of CTC. The process has been redesigned to neutralise the NCl3 stream. In another plant cryogenic systems are applied to neutralise the NCl3. The liquid chlorine with NCl3 is directly used in the manufacture of monochloroacetic acid. In the third plant, an alternative chlorinated solvent is being used instead of CTC.

(4) POSSIBLE ENVIRONMENTAL PROBLEMS WITH ODS ALTERNATIVES

Waste from processes can contain solid residues, hydrocarbons, solvent and water. Waste should be treated with recirculation of some materials and/or sent for destruction. The alternatives to ODSs sometimes give rise to new environmental problems, which can be divided into:

- Water pollution with increased discharges of e.g. heavy metals, tensides (nonyl phenolethoxylates (NPE) and nonyl phenols (NE)) and complexing agents. These pollutants can cause adverse biodegradability and/or synergistic toxicity, e.g. NPE and NE are targeted for introduction into the OECD risk reduction programme.

New technology based on e.g. chemical precipitation, filtration, reverse osmosis, ion exchange, adsorption, evaporation etc. can drastically reduce effluent volumes. Such systems are already on the market.

- Air Pollution Increased emissions of volatile organic compounds (VOCs) contribute to formation of atmospheric ozone and the greenhouse effect (via high GWP). Certain other compounds (e.g. 1,1,1-trichloroethane, HCFCs) also contribute to depletion of the stratospheric ozone layer. It is estimated that the solvent emissions can be reduced by 80-99 percent depending upon process and methods used.
- Occupational hygiene standards and fire safety standards must also be met when alternative solvents are used. Adsorption filters within such enclosed room add to the risk and may require additional classifications.
- Solvent transport and storage in the vicinity of the processing units should be reduced to the absolute minimum and monitored

- Alarm systems should be installed and backed up by fire extinguishers (water, or preferably non-halon, foam type).

(5) COSTS OF ODS PHASE OUT IN THE SWEDISH SOLVENT SECTOR

Overall, the phase-out of ODS in Sweden at an advanced stage. However a major portion of the use of all ODSs (including HCFCs, Methyl Bromide, CFC,CTC, 1,1,1-trichloroethane, halsons) have been addressed. Table 3 summarises the overall reduction untill according to a 1995 evaluation.

No.	Substance	Use, 1988 ODS tonnes	Use, 1994 ODS tonnes	Percent phase-out
1	CFC (in brackets: CFC-113)	4620 (500)	280 (0)	94% (100%)
2	HCFC	910	300	67%
3	1,1,1-trichloroethane	2200	0	100%
4	Carbon tetrachloride	201	6	97%
5	Methylbromide	60	45	25%
6	Halons	53 (1989)	9 (1993)	83%
	Total	8044	640	92%

For the phase-out of CFCs alone the costs at the beginning of the phase-out programme (1988) were estimated as follows:

No.	Application/sub-sector	CFC Use, 1988, ODS tonnes	Equipment Investment Costs, M$	Initial Onetime Costs M$	% Change in Operating Cost,
1	Aerosols	120	<1.43	-	-
2	Sterilisation (solvent)	10	<0.14	<0.14	<10
3	Release Agents (solvent)	90	<0.71	<1.43	<10
4	Flexible foam	400	<0.71	-	<10
5	Extruded polystyrenes (XPS)	900	<1.43	<0.71	<30
6	Polyurethane insulation (PUR)	950	<14.29	<1.43	<30
7	Polyurethane constructions	400	<2.86	<0.29	<10
8	Degreasing/cleaning (solvent)	500 (300)	<14.29	minor	probably less
9	Dry cleaning	see above (200)	?	?	?
10	Refrigeration and Heat. sector	1250	-	<4.29	<30
11	Other sectors /miscellaneous	12			
	TOTAL	4632	35.86	8.3	0-30

1$=7 SEK.

At an interest rate of 8-10% and a 10 year write-off, factorised at 0.15-0.16, the estimated CFC phase-out costs can be summarised to be as follows:

- For the cleaning/degreasing sector: approximately 7.5 US$/kg ODS
- Sterilisation sector: approximately 4.3 US$/kg ODS
- Release agents approximately 3.7 US$/kg ODS
- Not taking into account change in operating cost (estimated to remain unchanged for some sectors and increase by up to 30 percent for others), the total phase-out was estimate to cost approximately 1.5 US$/kg ODS.

The same cost estimates were revisited in 1995 with some greater resolution. The overall estimates for the ODS phase-out were based on the following components: For enterprises:

- Developing costs
- Investments
- Premature write-off of equipment
- Change in operating costs
- System costs
- Administrative costs For Authorities, the costs were included for:
- The communal (district) and county (provincial) authorities
- Central national authorities
- Collection and disposal of waste systems

Table: 1995

No.	Application/sub-sector	CFC Use, 1988, ODS tonnes	Equipment Investment Costs, M$	Initial Onetime Costs M$	Total Investment Costs, M$
1	Aerosols	120	1	0.71	1.71
2	Sterilisation (solvent)	10	-	0.14	0.14
3	Release Agents (solvent)	90*	<0.71	<1.43	<10
4	Flexible foam	400	minor	0.71	0.71
5	Extruded polystyrenes (XPS)	900	<1.43	<0.71	2.14
6	Polyurethane insulation (PUR)	950	11.43	2.14	13.57
7	Polyurethane constructions	400	0,71	1.71	2.42
8	Degreasing/cleaning (solvent)	300	1.86	1.71	3.57
9	Dry cleaning	200	2.86	0	2.86
10	Refrigeration and Heat. sector	1250	92.86	5.71	98.57
11	Other sub-sector /miscellaneous	12			
	TOTAL	4632	112.86	14.97	127.83

1$=7 SEK.

At an interest rate of 8-10% and a 10 year write-off, factorised at 0.15-0.16, the estimated CFC phase-out costs, without taking change in operational costs, can be summarised to be as follows:

- For the cleaning/degreasing sector: approximately 1.84 US$/kg ODS
- For the dry cleaning sector: approximately 2.22 US$/kg ODS
- Sterilisation sector: approximately 2.17 US$/kg ODS
- Release agents approximately 3.7 US$/kg ODS
- Solvent aerosols segment: approximately 2.21 US$/kg ODS
- The total phase-out was estimate to cost approximately 4.3 US$/kg ODS.

Table: 1995/2

No.	Application/sub-sector	Phase-out, 1988-1995, ODS tonnes	Equipment Investment Costs, M$	Initial Onetime Costs M$	Total Investment Costs, M$
1	Aerosols CFC	120	0.71	0.71	1.42

No.	Application/sub-sector	Phase-out, 1988-1995, ODS tonnes	Equipment Investment Costs, M$	Initial Onetime Costs M$	Total Investment Costs, M$
2	Sterilisation (CFC)	10	0.14	0.14	0.28
3	Degreasing/cleaning (CFC)	300	1.86	1.71	3.57
4	Dry cleaning (CFC)	200	3.57	0.43	4.00 (6.6-9.0)
5	Release agents (CFC)	90	0.71	0.14	0.85
6	Solvent (1,1,1-trichloroethane)	2200	7.86	1.85	9.71
7	Carbon tetrachloride (CPI)	195	4.0	0.71	4.71
	Total	3115	18.85	5.69	24.54

1$=7 SEK.

Table: 1995/3 At an interest rate of 8-10% and a 10 year write-off, factorised at 0.155, the estimated phase-out costs, without taking change in operational costs, can be summarised to be as follow

No.	Application/sub-sector	Phase-out, 1988-1995, ODS tonnes/year	Phase-out, 1988-1995, ODP tonnes/year	Unit Abatement Cost US$/kg ODS	Total Investment Costs, M$
1	Aerosols CFC (CFC-113)	120	96 (at ODP 0.8)	1.83	2.29
2	Sterilisation (CFC-12)	10	10 (at ODP 0.8)	4.43	4.43
3	Degreasing/cleaning (CFC-113)	300	240	1.84	2.31
4	Dry cleaning (CFC-113)	200	160	3.10 (5.12-6.98)	3.88 (6.39-8.72)
5	Release agents (CFC-113)	90	72	1.46	1.83
6	Solvent (1,1,1-trichloroethane)	2200	220 (at ODP 0.1)	0.68	6.84
7	Carbon tetrachloride (CPI**)	195	215.5 (at ODP 1.1)	3.74	3.39
	Total	3115	1014	1.8-3.7 (7.0)	2.3-6.8 (8.7)

1$=7 SEK.

** CPI = Chemical process industry

(6) CONCLUSION

An intensive amount of work has been and is being carried out to identify alternatives to ODS use in the engineering industry. Solutions tend to vary and may require combinations of various methods. However, viable alternatives are available and it can be concluded that in practically all major instances, there are a number of solutions on hand.

In lieu of the threat to life on planet earth, emanating from the depletion of the ozone layer, and the ingenuity that hallmarks the engineering industry, a complete elimination of the use of ODS prior to the year 1997, world wide, cannot be considered to be an over ambitious goal.

2.4. Results of Working Groups A-D

2.4.1. Working Group A: Are Emission Limit Values (ELV) in the VOC the best way to protect environment? (Is for CHC the VOC directive sufficient to protect the environment?)

(Chair: Guenter DUSSING, Austria;
Rapporteur: Norbert SCHIESS, Germany)

(1) Participants		
	HLINOVA, Yvonna	Czech Republic
	LOTZ, Tamas	Hungary
	MALICHA, Rosemarie	Austria
	MOROHOI, Rodica E.	Romania
	NEWMAN, Peter	United Kingdom
	ORTWEIN, Juergen	Germany
	WOLDENDORP, Hans Erik	European Commission

(2) Introduction

The work started with an overview about the current situation in the countries participating in the working group.

Country	Which CHCs are already prohibited in your country?	Are there any national regulations limiting CHC – emissions? Technical Instruction on Air Pollution Control
Austria	$CCl_{4,}$ 1,1,1- Trichloroethene	CHC-plant ordinance state-of-the-art
Czech Republic	$CCl_{4,}$ 1,1,1- Trichloroethene	TA Luft state-of-the-art
Germany, Saxony	All except Dichloromethane (DCM), Trichloroethylene (TRI) and Tetrachloroethylene (PER)	• 2. BlmSchV, • 4. BlmSchV - state –of- the- art • TA Luft
Hungary	$CCl_{4,}$ 1,1,1- Trichloroethene	TA Luft VOC -> 2001
Romania	$CCl_{4,}$ 1,1,1- Trichloroethene - particularly	TA Luft
United Kingdom	$CCl_{4,}$ 1,1,1- Trichloroethene	IPPC reg.

To minimize the CHC – emissions in the air, the participants discussed how to handle /to implement the VOC – directive in the memberstates and the accession countries. Just the key-words: - self monitoring, - sectors of activities and their thresholds, - reduction scheme. The results are: there are only a few sectors where the CHC use is important, which are **surface cleaning** (> 1 t/a), **oil and fat extraction** (>10 t/a), **adhesive coating** (>5 t/a) and **dry cleaning** (>0 t/a).

In account to the status quo in the member states and accession countries the members of this working group decided to have 5 headlines to collect ideas for the minimization of CHC – emissions results.

(3) Technical Standards

- BAT should be developed
- Closed systems to reduce the emissions at the source
- Abatement equipment at the state – of – the – art
- The operator must handle carefully with the facilities –„do it on his own authority“
- VOC is a good basis, but only the first step

(4) VOC Thresholds

- VOC thresholds are too high
- No thresholds for CHC's
- VOC is only a framework
- Tighter national regulations/standards must still exist beneath VOC – directive
- Monitoring of the implementation in the member states => „are we on the right way?“ What is about smaller installations?

(5) Alternatives

- 1 step for the users of CHC's must be to check the possibility of alternatives
- there are already a lot of alternative substances in use like water – based solvents, Hydrocarbon solvents and others (CO_2)
- no solvent systems
- financial support by the Commission

(6) Enforcement Practices

- Inspections (periodically)
- Institutional strengthening
- Measuring systems
- Reporting

(7) Monitoring System

- Guidance for self-monitoring
- Quality assurance
- Check the total CHC-emissions devided into VOC-installations and non-VOC-installations
- Check the total CHC-consumption devided into VOC-installations and non-VOC-installations

(8) Conclusion

The VOC-directive provides a frame and is the first step in the right direction. At the moment there is no decision possible, if the directive is sufficient. In 2 or 3 years after implementation of VOC – directive it should be evaluated, if we are still on the right way to reduce VOC/CHC – emissions.

2.4.2. Working Group B: Methods of Estimation & Calculation of Fugitive Emissions

(Chair: Marie O'CONNOR, Ireland;
Rapporteur: Susanna EBERHARTINGER, Austria)

(1) Participants:	CURK, Brigitta	Slovenia
	DEIMBOECK, Wolfgang	Austria
	GEORGIADOS, Stelios	Cyprus
	HRABAL, Ivan	Czech Republic
	MUCHITSCH, Wilhelm	Austria
	RAJNIAK, Ivan	Slovak Republic
	SIRENDI, Aare	Estonia

Target: Find a system of estimation and calculation of fugitive emissions by doing an evaluation and comparison of EU-methods.

The opening question in this working group was: „What methods are used in the countries participating in the working group?„

The answers to this question were rather scarce: It seems that, if any, methods for the calculation of fugitive emissions are only existent for large plants (e.g. refineries, mineral oil distribution, chemical and pharmaceutical industry). .

If a method is used it is basically a mass balance in more or less detail.

For small plants the following equations are used: F = I1; F = I - O1;

For large plants a more refined mass balance based upon method (2) (eg. in IRL) or method (1) can be applied.

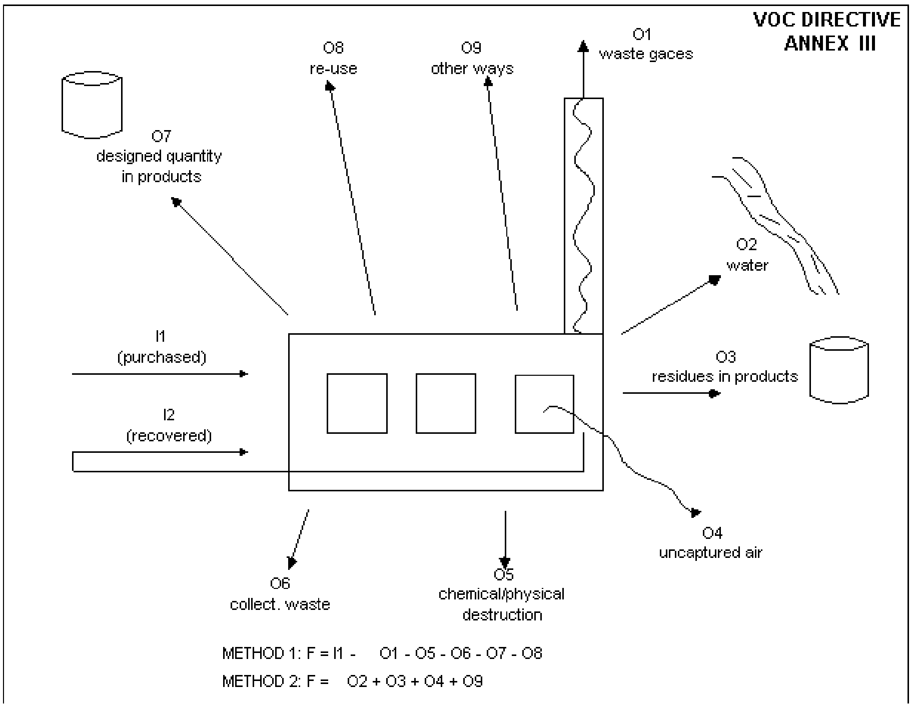
The working group regarded it as essential that first of all (i.e. before discussing a system for calculation) clear definitions of inputs and outputs are to be established.

The definitions of the various possible inputs and outputs of volatile organic compounds laid down in Annex III (solvent management plan) of the VOC-Directive were used as a starting point.

This Annex also provides two possible methods for the calculation of fugitive emissions:

Method (1): F = I1 - O1 - O5 - O6 - O7 - O8

Method (2): F = O2 + O3 + O4 + O9



Consequently, the working group tried to define the possible sources of CHC emissions in more detail and also indicated which data are required for the calculation/estimation of the respective output.

(2) O1: CHC emissions in waste gases

- via stack or abatement equipment
- not room ventilation (mechanical extraction systems)

Required data:

- measurements (during normal operation)
- production figures
- flow rate

VOC Directive

- obligation for continuous measurements: >10 kg/h mass flow

(3) O2: CHC emissions into water

- water leaving the site
- cleaned water after waste water treatment

Required data:

- measurements
- production figures
- flow rate

For most countries there exist ELV's for CHC's into water.

(4) O3: CHC residues in products

- residues, contamination in/on products
- drying losses outside the plant

Required data:

- measurements where feasible or estimation

(5) O4: uncaptured CHC emissions into air

- room ventilation
- windows, doors, vents
- tanks
- valve, flanges, pump seals
- waste water treatment: evaporation losses

Required data:

- ventilation: measurements and flow rate
- large storage tanks: estimation of losses with computer modelling
- valves, flanges etc: knowledge of process components and types, analytical method or computer modelling
- waste water treatment evaporation: difference input – output, computer modelling
- windows, doors etc: ? (estimations)

(6) O5: CHC's chemically or physically destroyed

- abatement equipment (incineration, ...)
- waste water treatment

- not O6, O7 or O8

Required data:

- efficiency of removal
- difference input – output

(7) O6: CHC's in collected waste

- used filters, cleaning rags
- waste water treatment sludge

Required data:

- measurements where feasible or estimation

(8) O7: CHC's in products (designed to be)

Required data:

- quality data

(9) O8: CHC's for re-use

- not I2
- e.g. offsite cleaning

Required data:

- measurements

(10) O9: CHC's released in other ways

- spillages to soil
- CHC's in walls

Required data:

- ?

(11) Recommendations

for operators:

- identification of all possible CHC inputs and outputs
- elaboration of a detailed solvent management plan (see Annex III of the VOC-Directive)
- annual check of inputs and outputs
- preferred use of method (1)
- comparison/check with method (2)
- identification of reduction measures

for authorities:

- standardised methods for calculation are needed (preferably on EU-level)
- give advice to operators (guidelines, oral information)

What we need

- more information about practice in other countries

2.4.3. Working Group C: Pollution Prevention Concerning CHC – With Special Emphasis on Soil and Water

(Chair: Wolfgang BOLZER, Austria,
Rapporteur: Matjaž NEMANIČ, Slovenia)

(1) Participants:

CARNIEL, Alberto	Italy
DUMITRESCU, Carmen	Romania
GEISBACHER, Daniel	Slovak Republic
GRACA, Bravo	Portugal
MASILEVICIUS, Rolandas	Lithuania
SILE, Mara	Latvia
VARGA, Pal	Hungary

(2) Information

Data bases on CHC should be created

- List of plants involved
- List of CHC and their properties
- Import/export companies
- Waste collectors
- Authorities/ enforcement bodies/ authorised institutions
- Legal background (legislation: national and European) on CHC
- BAT, state of art, technical standards

National frame of CHC Data basis should be included within the national environmental programmes.

Distribution of information to all involved parties.

(3) Education

- Public awareness => public opinion => public hearings, science, inhabitants (neighbours)
- Education of the technical staff, safety and environmental aspects: training, examination, licence
- Legal frame by the authorities (and enforcement), implemented by industry

(4) BAT

- Should be listed on an European level
- As long as BAT are not stated “state of the art” is obligatory
- Prevention of export of “bad technology” to access countries and developing countries

(5) Technology

- Clear maps (overview) of process and technology
- No underground pipes or tanks (only under special circumstances)
- Closed systems
- Double wall pipes and tanks
- Protective layers
- Traps (leakage control)

- Introduction of CHC – free technologies (e.g) water systems, other solvents) according to the industrial branch and its technological demands => no unique solutions (that does not mean prohibition of CHC), contradictority of CHC + and – characteristics
- Change in technology demands a new permit
- No transfer of pollution (air, water, soil)
- Recycle and reuse: clear CHC waste control management and regulations, reuse => decrease of CHC consumption, recycling => internal/external

(6) Legal Background

- Transposition and implementation of general and special CHC legislation
- Permits and license for limited period
- ELV (emission limit values) => concentration/production
- Guideline limit values for CHC for soil, ground- and surface water

(7) Monitoring

- Monitoring is obligatory in respect of production amounts/CHC – use/ water amounts
- Done by authorities as authorised institutions
- Self monitoring: automatically => process, end of pipe (air and water*), environment (air/water*/ soil*) * if possible
- Results should be transported to the authorities

(8) Inspection

- Frequency of inspection should be higher for those plants using CHC which have no (environmental) quality control system
- Regularly visits of special inspectors (working safety, environment ...) also commission of all involved inspectors should be done (integrated inspection)
- Not announced inspections of CHC – plant in special cases

(9) Financing

- Authorities should establish Eco funds for studies (CHC impact), improvement (technology/Eco – management => funding: state Eco – taxes, EU - funds) and remediation
- Industry uses or applies for Eco – fund resources
- Insurance should be obligatory for CHC plants to cover the remediation of environmental damages

2.4.4. Working Group D: Soil- and Groundwater-Remediation

(Chair: Dietmar MUELLER, Austria;
Rapporteur: Michael RABITSCH, Austria)

(1) Participants:

JAUNZEME, Aiza	Latvia
PLANCIUNAITE, Angele	Lithuania
FULVIO, Daris Fulvio	Italy
REISELHUBER, Karl	Austria

(2) Scope of the Problem

Physical and chemical properties:

- CHC can disperse through a surface sealing and penetrate the underlying soil.
- For the higher density, compared to water, CHC liquids can hit through the groundwater table down till the bottom of an aquifer.
- Compared to other organic contaminants the biodegradability of CHC is low.
- Despite the generally low solubility of CHC in water the substances are known as the most "mobile" organic contaminant in groundwater environments (see "Case records").

Case records for contaminated sites

- Several statistical approaches for case studies in different countries (e.g. USA, Germany, Austria) have shown that CHC contaminated sites can affect groundwater by very long plumes of contamination.
- Plumes of other organic contaminants usually do not reach longer than 100 m. In comparison detected CHC-plumes reach five to ten times longer (> 500 m).
- There are several CHC-contaminated sites in Europe known which cause plumes of a length of more than 10 km up to a maximum of more than 50 km.
- The first report of the European Environment Agency on "Groundwater quality and quantity in Europe" (Copenhagen, 1999) identifies CHC as a main contamination problem for groundwater.

(3) Legal Background

VOC-Directive 1999/13/EC:

- No regulations on behalf of possible soil- or groundwater contamination

Soil protection and/or soil policies:

- No regulations on European level expected within the next decade.
- Currently it is a main topic to raise the public awareness for the problems in the field of soil protection and to improve international co-operation for the development of the technical and scientific basis. Therefore different European networks (e.g. Common Forum for Contaminated Land, European Topic Centre Soil, Clarinet) have been established .

Groundwater-Directive 1980/68/EC

- Direct discharges of CHC to groundwater prohibited.
- Authorizations for indirect discharges are necessary.

Groundwater Action Plan (draft 1996)

- Four main lines of Action
  I. Planning and management principles
  II. Abstraction fresh water
  III. Diffuse sources of pollution (=> especially agricultural impacts)

IV. Control of point source pollution from activities and facilities which may affect groundwater quality

Proposal for the water framework directive

- Proposal for a Council Directive (COM (97) 49 final) establishing a framework for Community action in the field of water policy
- **!! Nowadays it is expected that this directive will become the main driving force for contaminated sites in general !!**

Targets

- prevent further deteriation, protect and enhance the status of aquatic ecosystems (quality & quantity)
- promote a sustainable water use

Quality Standards

- good status of groundwater resources (defined by Environmental Quality Standards - CHC equal to drinking water standards)
- ***stop further detoriation and revise upward trends !!!***

Whitepaper for environmental liability (Bruxelles, 2000)

- It is planned to transform this recently published paper and develop a Council Directive within the next years.

Community framework for environmental subsidies:

- Adoption for the framework for public funding of environmental projects is planned:
  - No more funding for remediation, if there is a responsible polluter (cutting of funding from up to 30 % to zero).
  - Funding for "old contamination", without a responsible polluter, to a maximum of 30 %.

(4) TOPIC 1: Environmental Targets

OVERALL TARGET

- To reduce and minimise CHC-pollution at contaminated sites to a level, where no reasonable emissions and further dispersion appear.
- TWO CORRESPONDING ASPECTS
  - Water protection
  - Soil protection

Groundwater protection and remediation

- The mentioned overall target meets the principles of the proposal for the Framework Directive for Water Policies (good status of groundwater resources & stop further detoriation).
- Due to this there is no need for further legislation
- RECOMMENDATION:
  As the Framework Directive looks for the preservation of groundwater resources at an regional level within river basins, it would be valuable to give additional technical guidance for investigation, monitoring and evaluation of the impact of CHC-plants, affecting the groundwater along small but intensive and long plumes.

Soil protection and remediation

- There is a lack for legislation and technical guidelines on soil protection on an European level.
- At the moment the primary objective is to improve international co-operation for the development of the scientific and technical basis.
- RECOMMENDATION:
  Therefore it would be necessary to add specific regulations, covering the duty for monitoring soil gas and introducing screening values for CHC. This should be done within the VOC-Directive.

(5) TOPIC 2: Sampling Techniques

- **Soil**:
  Due to the physical properties of CHC there are no appropriate sampling techniques available.
- **Soil gas**:
  Sampling of soil gas could be a convenient method for the monitoring of the impacts of CHC plants to the unsaturated zone. There are a couple of different methods, which can bring up varying and not comparable results.
- **Water**:
  Sampling techniques are robust and well known.
- <u>RECOMMENDATION:</u>
  Reconciled with prospective future legislation for soil gas monitoring nearby CHC-plants, there would be a demand for technical guidelines, referring to different site conditions (soil and geology), the methods of sampling and the characteristics of the soil gas sensor.

(6) TOPIC 3: Remediation Techniques

- There are different technologies for remediation available and there is no specific demand for regulations on an European level.
- In behalf of in-situ remediation (e.g. soil gas extraction) BAT for the treatment of contaminated gas and water are already existing.
- Target levels for CHC remediation projects should be identified individually with respect to the specific site conditions.
- In connection to the implementation of in-situ remediation measures aftercare, monitoring and recording are essential aspects to reach environmental targets on a long term.

(7) TOPIC 4: Contaminant and Site Characteristics

- The physical and chemical characteristics of CHC substances and the wide variety of soils and geological situations throughout Europe are of utmost importance and govern the possibilities for investigation and remediation of CHC-contaminated sites.
- Therefore these aspects must be considered for all exercises within managing CHC-contaminated sites, soils and groundwater (see e.g. Topics 2 and 3).

(8) TOPIC 5: Liability and Costs

It is of utmost importance to differentiate between

"new contamination", which had or will happen after specific legislation has been passed and

"old contamination", which had happened at a time without or before specific regulations.

<u>"New" pollution:</u>

- As a principle to European legislation ***" polluter pays"***

<u>"Old pollution"</u>

- The raising of public funds and the funding of remediation projects is seen as a fundamental assumption for the conversion of remediation projects.
- For the majority of contaminated sites the costs of remediation projects are an obstacle which scare away investors.
- Considering economic, socio-economic and environmental aspects the development and the reintegration of contaminated land into the economic circle would be of common interest for a sustainable development.

<u>RECOMMONDATION:</u>

- A framework for funding and raising funds **solely** for the remediation of "old contaminations" could be a basis for improving the activities within remediation, revitalisation and reintegration of contaminated sites and brownfields in general.
- Any action on European level for funding and raising funds should promote financial incentives to an extent that investors are attracted and can be brought back to former commercially used land.

- Any regulation within this field should provide a basis to weigh economical aspects of increasing values of properties against environmental aspects differentiated and carefully.

2.5. Results of Company Visits

2.5.1. Visit to Company "ECO" (Koetschach Mauthen, Austria)

Group A, 9.45 – 11.30 am.

Group B, 4.30 – 6.00 pm.

- production of heat-exchanger
- 260 employees
- 20 m3 perchloroethylene vacuum plant for degreasing of heat-exchangers:
- big collecting tanks with air warning instruments
- safety managment plan
- The plant is 4 years old and a pilot plant. Due to the new vacuum system the consumption of perchloroethylene was reduced from more than 2 tons per month to 500 kg per year.
- The participants could convince themselves that there is not any smell of perchloroethylene even immediately after opening the vacuum chamber at the end of the cleaning process.
- The site of the old plant was contaminated and remediated until 1998. Today there is no more contamination of soil and groundwater.

2.5.2. Visit to Company "ETA" (Cerkno, Slovenia)

Group A, 4.30 – 5.30 pm

Group B, 11.30 – 12.30 am.

- founded 1947
- 1636 employees totally, <400 at Cerkno
- production of radiant-heater, hot plates, thermostats, tubular heaters, foundry
- The company used 1,1,1-trichloroethan, perchloroethylene and trichloroethylen for degreasing of thermostats with a consumption of 250 kg/month
- Since 1990 two new plants use tetrachlorethylene with a consumption of 30 kg/year:
- This 2 devices have a capacity of 300 kg each. There are no air filter systems or collection tanks. The devices are situated in the 1st floor.
- In the 3rd floor there is an open system using trichloroethylene. The cleaning basin has a capacity of appr. 200 l. There is no air filter system or collection tank.
- So far no investigations of soil or groundwater to detect contaminations have been undertaken.

3. FINAL CONCLUSIONS

In the final plenary discussion and in the discussion immediately after the presentations of the results of the working groups many contributions were made by the participants. Generally the participants agreed with the results of the 4 working groups.

Throughout the discussion it became obvious that there is an urgent need of information for the MS as well as for the AC. The information should be provided via internet by IMPEL. At the moment the EU-regulations seems to be sufficient, but for a harmonised implementation the civil servants need clarification concerning technical details. For example it cannot be accepted that totally encapsulated plants are not compulsory in many MS and AC. Particularly for smaller installations there is a need for standardisation, because EU-regulations mostly apply for larger plants. The best way of standardisation could be done by EN or BAT. But it would be also very helpful, if civil servants get more information on national guidelines. As a conclusion the main issues are highlighted and summarised as follows:

1. The VOC-directive is a starting point in the right direction, but
    - Implementation in the MS has to be monitored and
    - An amendment for soil gas analysis should be done, in order to detect and avoid soil and groundwater contaminations.
2. There is an urgent need for several guidelines concerning
    - calculation of fugitive emissions
    - technologies for the use and storage of CHCs
    - soil & water limit and threshold values for remediation
    - methods of sampling & monitoring concerning soil and water analysis
3. The is an urgent need for information data bases, which could be provided via IMPEL concerning
    - practices and guidelines in other countries
    - BAT
    - alternatives of CHC
4. There is an urgent need for harmonisation of ECO-funds in order to support
    - the remediation of old contaminated sites
    - the use of alternatives and substitutes to CHCs
    - the use of best technologies

Whereas as the recommendations of item 1 and 4 is mainly addressed to the EC, standardisation by guidelines in item 2 should be implemented by BAT or EN and item 3 should be considered by the IMPEL-network and also discussed in the IMPEL 2000 Conference from 11th to 13th of October 2000 in Villach, Carinthia.

ANNEX A

Agenda

Contents

Saturday, March 11, 2000

Arrival of participants

Sunday, March 12, 2000

15.00-16.00
Guided Tour to „Stift Ossiach“ (Abbey Ossiach)

18.00 – 19.00
Preparatory meeting of chairs and rapporteurs

18.00-19.00
Registration of participants

20.00
Welcome drink in the Hotel and dinner

Day 1: Monday, March 13, 2000

08.00: Registration

09.00: Opening Session

09.00: Welcome
Herbert SCHILLER
Carinthian Minister of the Environment, Klagenfurt, Austria

09.10: The IMPEL Network
Karin MIKLAUTSCH
Government of the Province of Carinthia, Dept. 8W, Klagenfurt, Austria

09.20: Introducing CHC Workshop
Wolfgang HAFNER
Government of the Province of Carinthia, Dept 15 - Environment, Klagenfurt, Austria

09.30: Main Contributions-1/3

09.30: Toxicological and Environmental Aspects of CHCs
Wolfram PARZEFALL
University of Vienna, Institute of Cancer Research, Department of Toxicology, Vienna, Austria

10.00: Outline of the IPPC-Directive of the EC
Hans Erik WOLDENDORP
European Commission, Brussels, Belgium

10.15: Legislative Background from EC-IPPC, VOC, Water Directives and Other Relevant Community Legislation
Ilse SCHINDLER
Austrian Federal Environmental Agency, Vienna, Austria

10.45-11.00: Coffee Break

11.00: Main Contributions-2/3

11.00: History and Development of CHCs
Günter DUSSING
Provincial Government of Salzburg, Austria

11.30: Technical Standards for Plants Using CHC (Including Technologies to Reduce CHC Emissions)
Wilhelm MUCHITSCH
Austrian Federal Ministry for Economic Affairs, Vienna, Austria

12.00: Alternatives to CHC
Norbert SCHIESS
Government of Saxony, Ministry of Environment and Agriculture, Dresden, Germany

12.30-14.00: Lunch Break

14.00: Main Contributions-3/3

14.00: Results of Questionnaire
Wolfgang HAFNER
Government of the Province of Carinthia, Dept 15 - Environment, Klagenfurt, Austria

14.30: National Case Studies-1/2

14.30: Italy: Groundwater Contamination from Chlorinated Solvents in the North East Region of Italy
Alberto CARNIEL
ARPA Friuli Venezia Giulia, Dipartimento Provincinciale di Pordenone, Italy

15.00: Austria: Investigation and Remediation of CHC-Contaminated Sites in the Province of Upper Austria – Experiences on Problems and Solutions
Dietmar MUELLER
Austrian Federal Environmental Agency, Vienna, Austria

14.30-16.00: Coffee Break

16.00: National Case Studies-2/2

16.00: Germany: Surface Cleaning System in a Factory for Watches („Glashütte“)
Norbert SCHIESS
Government of Saxony, Ministry of Environment and Agriculture, Dresden, Germany

16.30: Ireland: CHC Reduction Using Cleaner Production Techniques in the Pharmaceutical Industry
Marie O’CONNOR
Environmental Protection Agency (EPA), Regional Inspectorate Cork, Ireland

17.00: Slovenia: Substitution of Ozone Depleting Substances (ODS) in Slovenian Industrial Plants
Matjaž NEMANIČ
Slovenian Ministry of Environment and Spatial Planning, Ljubljana, Slovenia

18.00: Dinner

After Dinner
Evening entertainment in the Hotel Restaurant „Akustisches Trio“ (Folk and Country music) – specially organised for participants of the IMPEL Workshop

Day 2 (A): Tuesday, March 14, 2000

Working Group A:
Are Emission Limit Values (ELV) in the VOC the best way to protect environment? (Is for CHC the VOC directive sufficient to protect the environment?)

Chair: Günter DUSSING
Provincial Government of Salzburg, Austria
Rapporteur: Norbert SCHIESS
Government of Saxony, Ministry of Environment and Agriculture, Dresden, Germany

09.00-09.30
■ Welcome
- Warm-up (getting acquainted)
- Presentation of the group's agenda for the day
- Rules of conversation
- Roles of chair and rapporteur

09.30-10.00
■ Generation of target orientation by presentation of concrete objective of the working group, which is ***„to define common standards and/or measures to minimise CHC emissions!" (emphasis on minimisation)***
■ Generation of common starting level by introducing the background, which is, that ***"some national regulations have higher standards in comparison with the VOC directive"*** (presentation of results of questionnaire)

10.00-11.30
Be creative by introducing personal ideas, experiences, etc.:
■ Opening question: „What – from your personal point of view – could be helpful to minimise CHC emissions, on the level of
- technical standards
- monitoring systems
- enforcement practices

■ Clustering the collected input (in form of cards) on pinboard.
- Expected Result: List of proposals for CHC emission minimisation.

11.30-12.30
■ Evaluation of the first result by comparing with VOC directive
- Expected results: List of differences

12.30-14.00
Lunch break

14.00-15.30
■ Discussion about common standards and measures to minimise emissions.
- Expected results of working group A: ***List of proposed common standards and measures to minimise emissions***

15.30-17.00
Time for chair and rapporteur to prepare their report for the final plenary session on 4th day of workshop

19.30
Reception in the "Tourismusschule" in Villach by Mr Herbert SCHILLER (Deputy Provincial Governor and Environmental Secretary of the Province of Carinthia, Austria). Buffet dinner and entertainment "Welken Nelken".

Day 2 (B): Tuesday, March 14, 2000

Working Group B:
Methods of estimation & calculation of fugitive emissions

Chair: Marie O'CONNOR
Environmental Protection Agency (EPA), Regional Inspectorate Cork, Ireland
Rapporteur: Susanna Eberhartinger
Federal Ministry for Environment, Vienna, Austria

09.00-09.30
Welcome
- Warm-up (getting acquainted)
- Presentation of the group's agenda for the day
- Rules of conversation
- Roles of chair and rapporteur

09.30-09.45
■ Generation of target orientation by presentation of concrete objective of the working group, which is ***"to find a system of estimation and calculation of fugitive emissions by doing an evaluation and comparison of EU-methods"***
■ Generation of a common starting level by introducing the background, which are the ***VOC directive*** and the ***results of questionnaire***

09.45-10.30
Be creative by introducing personal ideas, experiences, etc. using cards
■ Opening question: „........"
■ Clustering the collected input (in form of cards) on pin board.
- Expected results: List of topics, which can be used for small groups to work on

11.00-12.30
■ Small group discussion (3 groups) on: different methods of calculation / estimation / monitoring of the participants
■ Presentation of the results of the small groups

12.30-14.00
Lunch break

14.00–15.30
■ Discussion of positive and negative aspects
- Expected results of working group B: ***Proposal of a target system***

15.30-17.00
Time for chair and rapporteur to prepare their report for the final plenary session on 4th day of workshop

19.30
Reception in the "Tourismusschule" in Villach by Mr Herbert SCHILLER (Deputy Provincial Governor and Environmental Secretary of the Province of Carinthia, Austria). Buffet dinner and entertainment "Welken Nelken".

Day 2 (C): Tuesday, March 14, 2000

Working Group C:
Pollution prevention concerning CHC – with special emphasis on soil & water

Chair: Wolfgang BOLZER
City of Vienna, Austria
Rapporteur: Matjaz NEMANIČ
Slovenian Ministry of Environment and Spatial Planning, Ljubljana, Slovenia

09.00-09.30
Welcome
- Warm-up (getting acquainted)
- Presentation of the group's agenda for the day
- Rules of conversation
- Roles of chair and rapporteur

09.30-10.00
■ Generation of target orientation by presentation of concrete objective of the working group, which is ***"to develop a list of concrete recommendations for industry and authorities to prevent pollution of soil and water with CHC"***.
■ Generation of common starting level by introducing the background, which is the ***physical, toxicological and environmental problematic of CHC*** (short contribution by Alberto CARNIEL).

10.00-10.30:
Be creative by introducing personal ideas, experiences, etc. using cards
■ Opening question: „What are the concrete problems related to the use of CHC?"
■ Clustering the collected input (in form of cards) on pin board.
- Expected results: List of problems, which can be used for small working groups to work on.

11.00-12.30
■ Small group discussion (3 groups) on: define reasons of problems, develop first solutions.
■ Presentation of the results of the small groups

12.30-14.00
Lunch break

14.00-15.30
■ Discussion of results
- Expected result of working group C: ***Draft list of recommendations***

15.30-17.00
Time for chair and rapporteur to prepare their report for the final plenary session on 4th day of workshop

19.30
Reception in the "Tourismusschule" in Villach by Mr Herbert SCHILLER (Deputy Provincial Governor and Environmental Secretary of the Province of Carinthia, Austria). Buffet dinner and entertainment "Welken Nelken".

Day 2 (D): Tuesday, March 14, 2000

Working Group D:
Soil- and groundwater remediation

Chair: Dietmar MUELLER
Federal Environment Agency, Vienna, Austria
Rapporteur: Michael RABITSCH
Government of the Province of Carinthia, Klagenfurt, Austria

09.00-09.30
Welcome
- Warm-up (getting acquainted)
- Presentation of the group's agenda for the day
- Rules of conversation
- Roles of chair and rapporteur

09.30-10.00
■ Generation of target orientation by presentation of concrete objective of the working group, which is ***„to develop a list of concrete recommendations for soil- and groundwater remediation"***
■ Generation of common starting level by introducing the background, which is the ***legislation on EU level, the differences among member states (MS) and access countries (AC) in monitoring and remediation of contaminated sites, techniques, threshold values, financing, subsidies, costs etc***. (short speech by Mr. Dietmar MUELLER)

10.00-10.30
Be creative by introducing personal ideas, experiences, etc. using cards
■ Opening question: „What concrete problems and obstacles occur in monitoring & remediation of CHC contaminated soil and groundwater?"
■ Clustering the collected input (in form of cards) on pin board
- Expected result: List of problems, which can be used for small working groups to work on

11.00-12.30
■ Small group discussion (3 groups) to find proper measures to overcome problems
■ Presentation of the results of the small groups

12.30-14.00
Lunch break

14.00-15.30
■ Discussion of results
- Expected results of working group D: ***Draft list of recommendations***

15.30-17.00
Time for chair and rapporteur to prepare their report for the final plenary session on 4th day of workshop

19.30
Reception in the "Tourismusschule" in Villach by Mr Herbert SCHILLER (Deputy Provincial Governor and Environmental Secretary of the Province of Carinthia, Austria). Buffet dinner and entertainment "Welken Nelken".

Day 3: Wednesday, March 15, 2000

08.30-19.99: Excursion Group A

08.30
Start in Ossiach

09.30-11.00
Visit of company ECO in Kötschach Mauthen

12.00-13.30
Lunch in Villach

13.30
Departure to Cerkno

15.30-17.00
Visit of company ETA in Cerkno

17.00
Departure to Ossiach

19.00
Arrival in Ossiach

08.30-19.00: Excursion Group B

08.30
Start in Ossiach

10.30-12.00
Visit of company ETA in Cerkno

12.00-13.30
Lunch in Cerkno

13.30
Departure to Kötschach

16.00
Visit of company ECO in Kötschach Mauthen

17.30
Departure to Ossiach

19.00
Arrival in Ossiach

Day 4: Thursday, March 16, 2000

9.00 – 12.00
Resume and Discussion

12.00
Lunch

After lunch
departure of participants

ANNEX B

List of Participants

Contents

1. List of Participants of the Workshop

No.	Country	Name	Institution	Address	Phone	Fax	Email
1	Austria	BOLZER Wolfgang	City of Vienna	Feldgasse 9 1080 Wien	0043 1 40413 87831	0043 1 40413 99 87800	bol@m15.magwien.gv.at
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3	Austria	DUSSING Günter	Province of Salzburg	Postfach 527 5010 Salzburg	0043 662 8042 4548	0043 662 8042 4167	guenter.dussing@land-sbg.gv.at
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5	Austria	FRAUWALLNER Lydia	CENTRIC AUSTRIA ®- Carinthian Environmental Training an Infrastructure Center	Hauptplatz 27a 9300 St. Veit/Glan	0043 4212 28728	0043 4212 28728 15	office@centric.at
6	Austria	HAFNER Wolfgang	Province of Carinthia	Flatschacherstr. 70 9020 Klagenfurt	0043 463 536 31546	0043 463 536 31500	wolfgang.hafner@ktn.gv.at
7	Austria	MALICHA Rosemarie	Province of Carinthia	Flatschacherstr. 70 9020 Klagenfurt	0043 463 5360	0043 463 536 31500	chemiesv.abt15@ktn.gv.at
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2. Members of the Preparatory Team

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3. Further Involved Persons (Questionnaire,...)

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ANNEX C

Questionnaire

Contents

1. Legal background

What national laws and regulations exist in your country governing the use of chlorinated hydrocarbons (CHC) in industrial plants (including contaminated sites) with an CHC-consumption of more than 1 ton per year?

a) For new industrial plants (Please answer in key-words): CKW-Anlagen-Verordnung 1994 (BGBl.Nr. 865/1994); Ban of 1,1,1-Trichloroethane and Tetrachloromethane (BGBl.Nr. 776/1992 und 461/1998); [FCKW-Verordnung (BGBl.Nr. 55/1989 und 301/1990); HFCKW-Verordnung (BGBl.Nr. 750/1995)]; Groundwater-threshold-value-regulation (BGBl.Nr. 502/1991); Regulation for wastewater-emissions to (running) water or public sewage systems (BGBl.Nr. 186/1996) ____________________

b) For existing industrial plants (Please answer in key-words): The same like lit.a)____________________

c) What substances (or group of substances) are regulated and what are the thresholds?

Substance	**Threshold, if any**
CHC’s and CFHC’s generally (liquid at 20°C and 1013 hPa)	none

Space for **comments** ____________________

d) Is a licence or permit required (Please tick) ____________________ YES **X** NO☐

If yes, what are the thresholds?

In Austria a licence is for a plant generally necessary if there is a (even theoretical) possibility for

- danger to life and health of people,
- serious molestation of the neighbourhood,
- danger to water,...

Substance	**Thresholds**

2. Authorities and legal bodies

a) Which authorities are competent to issue a licence or a permit for industrial plants using chlorinated hydrocarbons?

YES☐ NO☐ National level, name ______

YES **X** NO☐ Regional level, name: Landeshauptmann (head of country-government) ______

YES **X** NO☐ Local level, name: Bezirkshauptmannschaft (district office) ______

Space for **comments:** It exists the possibility to appeal against a licence-decision to the next level of administration [Bezirkshauptmannschaft (district office) ? Landeshauptmann (head of country-government) ? Bundesminister für wirtschaftliche Angelegenheiten (federal Minister for economic affairs)] ______

______

b) Which authorities/institutions are competent for inspection of such plants?

YES☐ NO☐ National level, name ______

YES **X** NO☐ Regional level, name: see a) ______

YES **X** NO☐ Local level, name: see a) ______

Space for **comments** ______

______

c) Which authorities/institutions are competent for monitoring of such plants?

YES☐ NO☐ National level, name ______

YES **X** NO☐ Regional level, name: see a) ______

YES **X** NO☐ Local level, name: see a) ______

Space for **comments** ______

______

d) Which authorities/institutions are competent for the enforcement of regulations?

YES☐ NO☐ National authority, name ______

YES **X** NO☐ Regional authority, name: see a) ______

YES **X** NO☐ Local authority, name: see a) ______

Space for **comments** ______

______

______

______

______

3. Chlorinated Hydrocarbons

a) Which chlorinated hydrocarbons are prohibited in your country for use in industrial plants? (Please place a cross in the appropriate boxes and complete requsted data; use „space for comments„ to make your comments and explanations)

Substance	Prohibited since	Exception possible
X Tetrachloromethane	1992	YES **X** NO☐
X 1,1,1-Trichloroethane	1995	YES **X** NO☐
☐ other		YES☐ NO☐
☐		YES☐ NO☐
☐		

Space for **comments** ______________________________

According to the ordinance of the Federal Minister for Environment, Youth and Family concerning the prohibition of 1,1,1, - Trichlorethane and Tetrachloromethane (BGBl. No. 776/1992 amended with BGBl. II No. 461/1998) it is prohibited to substitute 1,1,1- Trichloroethane with Dichloromethane, Trichloroethylene or Tetrachloroethylene (some exceptions are possible)

Moreover, operators who are allowed to use 1,1,1-Trichloroethane are obliged to notify the amount of used 1,1,1-Trichloroethane each year and to inform whether the above mentioned substances for substitution are used.

b) Latest statistics of annual use of clorinated hydrocarbons in your country: If available please complete the table!

1996: 1900 t CHC

Substance	Intended purpose	Tons per year
Dichloromethane		680
Trichloroethane		285
1,1,1-, trichloroethylene		290
Tetrachloroethylene		645

Space for **comments** ____

____

____

____

____

____

____

4. Air emission limit values

a) Which air emission limit values apply for the use of chlorinated hydrocarbons in industrial plants? (Please complete table)

	daily average values (mg/m3)	half hourly average values (mg/m3)	total discharge (e.g. kg/day, t/year)	if other values, please specify and fill in
CHC – total		100 mg/m³ (massflow<50 g/h) 20 mg/m³ (massflow>50 g/h)		
CHC - total as Cl				
Dichloromethane				
Trichloroethane				
1,1,1-, trichloroethylene				
tetrachloroethylene				
Other				
Other				

Explanation: CHC = total sum of each chlorinted hydrocarbon

Space for **comments** ___

b) Do reference conditions apply for limit values? ___ YES X NO☐

YES X NO☐ Temperature / if so, please specify 0° C ___

YES X NO☐ Pressure / if so, please specify 1013 hPa ___

YES? NO X Dry / if so, please specify wet ___

YES☐ NO☐ Other / if so, please specify ___

YES☐ NO☐ Other / if so, please specify ___

Space for **comments** ___

c) Are the fugitive emissions considered? ___ YES☐ NO X

If so, ...

=> **please specify how they are limited**____

=> **please specify how they are calculated** ____

d) General question: Are air emission limit values fixed in regulations X or in the single licence ☐?
(Please tick)

Space for **comments** ____

5. Waste water emission limit values

a) Which water emission limit values apply for the use of chlorinated hydrocarbons in industrial plants?

	concentration values (mg/l)	total discharge (g/day, t/year)	if other values, please specify and fill in
CHC			
CHC as Cl	0,1 mg/*l*		
Dichloromethane			
Trichloroethane			
1,1,1-, trichloroethylene			
Tetrachloroethylene			
AOX	0,5 mg/*l* *)		
POX	0,1 mg/*l* *)		
Other			
Other			

Explanation: CHC = total sum of each chlorinted hydrocarbon

Space for **comments** ___

*) Regulation for general limitation of wastewater-emissions into (running) water or public sewage systems (BGBl. Nr. 186/1996) ___

___

___

b) General question: Are water emission limit values fixid in regulations X or in the single licence ☐? (Please tick)

Space for **comments** ___

___

___

___

___

___

6. Measures to prevent contamination of soil or groundwater

a) Which measures are applied?

		Please make a short description!
X	Bunding/collection device/catch basins or similar	for CHC-tanks, machinery and tubings
X	Enclosed plants	only in closed machinery
	Barrier layer / underground	
X	Leak detection systems	for storage of CHC in tanks (alternatively to catch basins)
	If other, please specify	

b) Are there any threshold values for soil or groundwater contamination?

		concentration values (mg/l or mg/m3)	consequences when exceeding (e.g. remediation, monitoring)	comments
X	Soil concentration	10 mg/m³ (0° C, 1013 hPa, wet)	information of the authority ? monitoring or remediation	soil-gas concentration Regulation (BGBl. Nr. 865/1994)
X	Groundwater concentration	18 µgCHC/*l* 0,2 µg/*l* (1,1-Dichloroethene) 1,8 µg/*l* (Tetrachloromethane) 6 µg/*l* (1,2-Dichloroethane) 6 µg/*l* (Tetrachloroethene)		Regulation (BGBl. Nr. 502/1991)
	Soil leachate concentration			
	If other, please specify			

More space for **comments**____

c) General question: Measures and threshold values are fixed in regulations X or in the single licence ☐ or in guidelines ☐? (Please tick)

Space for **comments** ____

7. Measures to avoid fugitive (=diffuse, uncaptured) emissions

a) Which measures are applied?

		Please make a short description!
	Air warning instruments	
X	Enclosed plants	enclosed machinery
	Barrier layer / air	
	Leak detection systems	
	If other, please specify	

b) Which methods of estimation and/or calculation of fugitive emissions are applied? Please describe your experience:

8. CHC Waste

How are CHC residues from an industrial plant in your country usually treated?

X Recycled ____________________

X Incinerated ____________________

X Chemical or physical treatement ____________________

☐ If other, please specify ____________________

9. Best available technology (BAT) (Please tick)

YES☐ NO☐ Does a standard for best available technology (BAT) exist in your country?

YES☐ NO☐ If so, does this standard serve as the basis for the permit of industrial plants using chlorinated hydrocarbons ?

YES☐ NO☐ If so, are these standards compulsory ☐ or guidelines ☐ ?

Space for **comments:** There are guidelines for the experts of the authority, which they have to use in the proceedings for licence/permit for CHC-plants. ______

10. Cleaner production

Please describe experiences in your country to introduce cleaner technologies
a) to use alternative substances

b) to introduce alternative processes

11. Subsidies and incentives

Does there exist in your country national/regional/local subsidies/incentives ...

a) to stimulate cleaner technology approaches? (If so, please describe in key-words)

accompanying the ordinance on plants using chlorinated hydrocarbons (BGBl.. No. 865/1994) there was the possibility to receive a subsidy of the Österreichische Kommunalkredit (duration until the end of the transition period, CHCs: 1.6.1999): prerequisite: new installation is state of the art, amount of subsidy: maximum 35 % of the environment related investment costs

additionally there exists (accompanying ordinances concerning the ban on certain substances, eg. HFCHCs) the possibility to subsidise the introduction of chlorinated hydrocarbon-free techniques (duration until the end of the substance related transition periods): amount of subsidy: maximum 30 % of the environment related investment costs

b) to stimulate BAT approaches? (If so, please describe in key-words) see a)

c) to support remediation projects? (If so, please describe in key-words) see a)

12. Authorization/permit/licence

a) Can the licence contain **additional mandatory conditions**? (Please tick and comment)

YES **X** NO☐ Concerning emission values __________

YES **X** NO☐ Concerning measures to prevent soil and groundwater contamination __________

YES **X** NO☐ Concerning monitoring __________

YES☐ NO **X** Concerning production data (e. g. temperature, pressure)__________

YES☐ NO☐ If other, please specify__________

YES☐ NO☐ If other, please specify__________

YES☐ NO☐ If other, please specify__________

Space for **comments** __________

c) The licence ... (Please tick and comment)

YES☐ NO **X** is **limited** to a certain time period. If so, which **period** __________

YES☐ NO **X** is **reviewed periodically**. If so, within which **period**__________

YES **X** NO☐ can be **reviewed by the authority** at any time *)__________

Space for **comments:** __________

*) Only if there is unforeseen danger to life or health of people, a heavy molestation of the neighbourhood or danger to the (ground)water. __________

13. Monitoring

Which form of monitoring of an industrial plant is usally applied for the given parameters? Please complete by ticking within the right quadrants and specify the frequency!

Frequency

	Medium	continiously	daily	monthly	twice a year	annual	every 2 years	every 3 years	every 5 years	others
	Medium	continiously	daily	mon-thly	twice a year	annual	every 2 years	every 3 years	every 5 years	others
self monitoring (either by own Staff or authorized private company)	technical equipment									weekly
	waste water concentration					x				
	air emission values					x				
	ambient air concentration									
	groundwater concentration									
	receptor water concentration									
	soil atmosphere concentration					x				
	others					x				cooling water

	Medium	continiously	daily	mon-thly	twice a year	annual	every 2 years	every 3 years	every 5 years	others
Monitoring by the authority (either by Authorithy's own Staff or authorized private company)	technical equipment									
	waste water concentration									
	air emission values									
	ambient air concentration									
	groundwater concentration									
	receptor water concentration									
	soil atmosphere concentration									
	soil lechate concentration									

Space for **comments** ____

____

14. Legal consequences for non-compliance (Please tick and complete)

a) Which legal body pursues non-compliances?

YES **X** NO☐ Administrative body, name: district office (Bezirkshauptmannschaft)____________

YES☐ NO☐ Court of justice for criminal affairs, name ____________

YES☐ NO☐ Court of justice for civil affairs, name____________

YES☐ NO☐ If other, please specify____________

b) Range (lowest to highest) of penalties for non-compliance: up to 2180 Euro *)

YES☐ NO☐ If other measures, please specify____________

Space for **comments:** ____________

*) for each point of non-compliance (This could be 10 and more points)____________

15. Final questions

Approximate number of ...

x industrial plants using more than 1 ton CHC per year in your country: approximative 10

x contaminated sites of industrial plants using CHC in your country: appr. 20 - 30

☐ Average duration of licensing procedures for such plants: 3 – 78(with appeals) weeks

Space for **comments** ____

Please enclose **additional comments** on an extra sheet!

Personal data

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Thank you very much for your co-operation!

ANNEX D

Evaluation of Questionnaire

Contents

IMPEL Workshop on the Use of Chlorinated Hydrocarbons in Industrial Plants
13th to 16th March 2000, Ossiach, Carinthia, Austria

QUESTIONNAIRE

Draft Evaluation

Among the chlorinated hydrocarbons the chlorine derivatives of methane and ethane find broad application as solvents. The most important substances are dichloromethane, 1,1,1-trichloroethane, trichloroethylene and tetrachloroethylene. Due to their inflammabiltity and excellent liposolubility they are as ever used in industrial processes for cleaning and degreasing, although it is well-known that chlorinated hydrocarbons may cause several impacts on the environment.

Due to current differences across the member states and the access countries, a lively exchange of information on the EU-wide practices on the use of chlorinated hydrocarbonats in industrial plants could be very helpful. There exist great differences in the basic legal requirements as well as in the implementation and enforcement across the Member States. The objective of this questionnaire is to gather information and to describe the situation in the Member States and Acess Countries regarding the **use of CHC in industrial plants, with an annual consumption of CHC more than 1 ton**. Special interests will be focused on emission limit values and fugitive emissions in regard to the VOC-Directive, on soil and grounwater protection measues as well as on soil and groundwater remediation.

To this target the participants of the workshop were asked to complete the questionnaire from the point of view of their country or region.

All participants of the workshop were requested to study a draft evaluation and make their corrections or amendments during the workshop. All received comments are considered in the latest version, which once again is sent to all responsible persons for the qustionnaire, in order to get a final feedback before publishing.

March 09, 2000 by Iris SPEISER and Wolfgang HAFNER

Return of completed questionnaires

	Responsible persons	Institution
Austria	Wilhelm Muchitsch	Federsl Ministry of Economical Affairs
Cyprus	Georghiades Stelios	Ministery of Labour and Social Insurance
Czech Republic	Yvonna Hlinova	Czech Environmental Inpectorate
Estonia	Aare Sirendi	Environmental Inspectorate
Germany	Norbert Schieß	Sächsische Staatsministerium für Umwelt und Landwirtschaft
Hungary	Tamas Lotz	Ministry for Environment of Hungary
Ireland	Marie O'Connor	Environmental Protection Agency
Italy	Daris Fulvio	Regional Directorate of Health
Latvia	Sile Mara	Lielriga Regionale Environmental Board
Lithuania	Masilevicius Rolandas	Ministry of Environmental Republic of Lithuania
Portugal	Graca Bravo	Inspectorate General of Environment
Romania	Carmen Dumitrescu	Ministry of Waters, Forests and Environmental Protection
Slovak Republic	Daniel Geisbacher	Slovak Inspectorate of Environment
Slovenia	Matjaz Nemanic	Ministry of Environment an Spatial Planning
Sweden	Inga Birgitta Larsson	Swedish Environmental Protection Agency
United Kingdom	Peter Newman	UK Environment Agency

1. Legal background

What national laws and regulations exist in your country governing the use of chlorinated hydrocarbons (CHC) in industrial plants (including contaminated sites) with an CHC consumption of more than 1 ton per year

Table 1	1a) For new industrial plants	1b) For existing industrial plants	1c) What substances (or group of substances) are regulated and what are the thresholds	1d) Is a licence or permit required?
Austria	CKW-Anlagen-Verordnung 1994 (BGBl.Nr. 865/1994); Ban of 1,1,1-Trichloroethane and Tetrachloromethane (BGBl.Nr. 776/1992 und 461/1998); [FCKW-Verordnung (BGBl.Nr. 55/1989 und 301/1990); HFCKW-Verordnung (BGBl.Nr. 750/1995)]; Groundwater-threshold-value-regulation (BGBl.Nr. 502/1991); Regulation for wastewater-emissions to (running) water or public sewage systems (BGBl.Nr. 186/1996)	The same like lit.a)	CHC's and CFHC's generally (liquid at 20°C and 1013 hPa) non	yes for a plant generally necessary if there is a (even theoretical) possibility for danger to life and health of people, serious molestation of the neighbourhood, danger to water,...
Cyprus	No specific laws => indirectly covered by the Atmospheric Pollution Control Law No 70/91	The same like lit.a)	1,1,1-Trichloroethane Tetrachloromethane see comments	yes → Dichloromethane → Trichloroethylene → Tetrachloroethylene No thresholds → import licence required by the Ministry of Commerce and Industry for record purposes

Table 1	**1a) For new industrial plants**	**1b) For existing industrial plants**	**1c) What substances (or group of substances) are regulated and what are the thresholds**	**1d) Is a licence or permit required?**
Czech Republic	Act 157/98 on Chemical substance and preparation Act 86/95 on Protection of Ozone Layer Act 309/91 on Air Protection	National acts and reputations (mentioned beside) don't bring any differences between new and existing industrial plants	Tetrachloromethane – 0 1,1,1 Trichloroethane – 0 Dichloromethane – 10t/year Trichloroethylene – 10t/year Tetrachloroethylene – 10t/year	yes → Dichlormethane – 10t/y → Trichlorethylene – 10t/y → Tetrachloroethylene – 10 t/y → other chlorinated derivates of Ethane – 10t/y
Estonia	Air quality, soil quality and groundwater limit values for different CHC's; wastewater limit value –1,0mg/l (total CHC)	The same like lit. a)	Total CHC in wastewater: 1mg/l Tetrachloroethylene in amb. air: 500mg/m^3 Trichloroethylene in amb.air: 4000mg/ m^3 Trichloromethane in amb.air: 300mg/ m^3	yes Comments: no emission thresholds in general. Emission limit values differ in different Industries.
Germany, Saxony	Federal Immission Control Act (BlmSchG), 2. Federal Immission Control Ordinance, Chemicals Act/Ordinance, Hazardous Substances Regulation, Soil Protection Act/Ordinance, Waste Water Regulation, Drinking Water Regulation	BlmschG, 2. BlmschV, Technical Instruction Air (TA Luft), etc. (see 1a)	Volatile CHC > 1 % Volume of the treatment vats exceeds 10 l CHC – „Class I substances" > 0,1 kg/h, Class II substances > 2 kg/h, Class III substances > 3 kg/h	yes → CHC in waste water – zero → CHC for the surface coating (there are no installations in Saxony known) – 25 kg/h → Extracting installations – capacity > 1t
Hungary	21/1986 Governments Decree is being just changed, by March 2000 the EU VOC Directive will be adopted. Therefore we prefer refer to the new regulation.	3/1984 NRA orders for wastewater effluent, 21/1986 Governm. Decree is being just changed, by March 2000 the VOC Council Directive of EU (13/EC/1999) will be adopted	Organic solvents (not mixable with water) – 0,05 x 10³m³/m³	No

Table 1	1a) For new industrial plants	1b) For existing industrial plants	1c) What substances (or group of substances) are regulated and what are the thresholds	1d) Is a licence or permit required?
Ireland	EPA Act 1992	EPA Act 1992	Not Substance specific thresholds similar fo IPPC Directive	Yes, but not applicable
Italy	L 28/12/93 m 549: in defense of stratosphere ozone and environment DM 05/09/94: list of unhealthy industries DM 12/08/98 commerce and use of some dangerous substances	See section a)	CHC (DM 05/09/94) 1,1,1 Trichloroehtane (1) Carbon Tetrachloride (1) Hexachloroehtane (2)	no
Latvia	Cemical Substances and chemical products law, Regulations on classification, packaging and labelling, regulations on safety data sheet	See section a)		no
Lithuania	The republic of Lithuania environmental protection law, Republic of Lithuania Law on environmental impact assessment	Permit for using natural resourses, Lithuanian environmental regulation 10-96 „Norms for waste water“, Higienic norms 35-98 „Available concentrations in ambiet air“	All emmssions to the atmosphere > 10 tons per year Waste water > 5 m³ per day	Licence is required for producing more than 5 t/year of CHC or for storage more than 50 tons of CHC. Lithuania dosen‘t produce CHC.
Portugal	see comments	All the factories need a permit to its work which is given by the Ministry of Economy. This permit is given to the factory after a visit by some competent authorities such as: Economy Ministry, Environment Ministry, Health Ministry and General Inspectorate of Work, which verify the compliance of some conditions.	The conditons involve the compliance of the legislation. The IPC Direcitve 96/61/EC of 24 Sep. 1996 will be posed in a short time ist implementation shall be change the existing permits.	All the factories need a permit to ist work which is given by the Ministry of Economy. This permit is given to the factory after visit by some competent authorities such as Economy Ministry, Environmental Ministry, Health Ministry and General Inspectorate of Work, which verify the compliance of some conditions.

Table 1	1a) For new industrial plants	1b) For existing industrial plants	1c) What substances (or group of substances) are regulated and what are the thresholds	1d) Is a licence or permit required?
Romania	-	-	see comments	-
Slovak Republic	Law no 309/1991 – the baislaw com. Air protection, Order of Government No 92/96, Law no 76/98 – ozon layer, protection law, Regulation of Min. of Env. No 283/98	The same as for new plants	Dichlormethane – mass flow >3kg/h - max. 150 mg/m³ Trichlorethylen – mass flow >0,1kg/h - max. 20 mg/m³ Tetrachlorethylen – mass flow > 2,0kg/h - max. 100 mg/m³ Trichlorethane	Permit is required for operation of units (sources of air pollution) in which chlorinated Hydrocarbons are used.
Slovenia	see comments			Yes , thresholds by year State Quote/Montreal Protocol CCl_4 1,1,1-Trichloroethane
Sweden	The Environmental Code	The Environmental Code	Dichloromethan, Trichloroethylene, 1,1,1, Trichloroethane, Carbontetrachloride, Hydrochloroflourocarbone, Chloroflourocarbone, Carbontetrachloride are all prohibited Tetrachloroethylene is prohibited for household consumers and regulated for dry cleaners Other halogenated organic compounds are regulated	Halogenated substances: a permit is required for handling 5 tonnes per year (if not prohibited see 1c)

Table 1	1a) For new industrial plants	1b) For existing industrial plants	1c) What substances (or group of substances) are regulated and what are the thresholds	1d) Is a licence or permit required?
United Kingdom	UK initiatives → Environmental Protection Act 1990, Environment Act 1995 EU initiatives → Decision 94/68/EC implementing Montreal Protocol, Directive on Ozone Depleting Substances, Directive 76/464/EEC on Dangerous Substances, Directive on Marketing and Use of Dangerous Substances. Directives on IPPC and Solvents Directive will also apply to the control of CHCs.	The same like lit a) Only distinction is when existing plant must be brought up to new plant standards	All CFCs	> 2-10 t /a regulted by Environment Agency < 2-10 t / a regulated by local authorities EIA for new CHC-plants > 2-10 t / a

<u>Comments:</u>

Cyprus c) The above substance are regulated according to the Montreal Protocol on Substances that deplete the Ozone layer and ist amendment which has been ratified by Cyprus in 1994. The quantities imported are reduced every year.

Germany The thresholds are fixed in the 2. Ferderal Immission Control Ordinance and Technical Instruction Air.

Hungary: General regulation of our new decree: 1.Carcinogen, mutagen substanees are very strictly regulated bases on the EU VOC directive (R-Sätze).

2.Compounds used for techniques in Annex II A of the directive above, the theresolds and elv of this directive are valid.

3.Compounds used out of this EU directive, the elv cf the TA-Luft are valid.

Ireland c) Activity is licensed rather than individual substance usage

Italy: (1) Cessation of Production, use, commercialization and Import-Export not later than 31.12.2008. (2) forbidden for processing of non-ferrous metals

Latvia: c) In future: regulations on prohibitions, limitations or restrictions on the handling, use and marketing of certain dangerous chemicals/at present/draft

Lithuania: Documents, mentioned in a) and b), are general for all industry and for all pollutants. If all amount of emission more than 10 tons per year, the permit is required. If discharge of waste water more than 5 m^3, the permit is required too.

Portugal: There is the Decree Law no 264/98 of 19 August 1998 (transposition of these Directives 94/60/EC of 20 December 1994, 96/55/EC of 4 Septmerber 1996, 97/10 EC of 26 February 1997 an 97/16/EC of 10 April 1997, concernig limitations for the commercializations and usage of some hazardous substances), which limit the use of some chlarinated hydrocarbons such as 1,2-dichlorethane, chloroform, tetrachloride of carbon, 1,2-trichloreathane, 1,1,2,2,-tetrachloroethane, 1,1,1,2-tetrachlorethane, pentachloroethane, 1,1-dichloroethylene and 1,1,1-trichloroethane.

Romania: There are no specific laws and regulations governing the use of CHC in industrial plants there are applied: => Law No 137/1995 on Environmental Protection, => Law No 84/1993 on the Ratification of the Vienna Convention on Ozone Layer Protection and Montreal Protocol on ODS, => Governmental Ordinance No 89/1999 on the Introduction of the Restrictons to the Use and Trade of Halogneated Hydrocarbons that delete the Ozone Layer

Sweden: The Environmental Code requests permits when handling more than 5 tonnes of halogenated substances per year (if not prohibited see above) and requests notification when handling 500kg – 5 tonnes of halogenated substances per year (if not prohibited see above). A dry cleaner using tetrachloroethylene (or other solvents) is requested to notify the authority.

<u>Sovenia (1): FIELD: WATER</u>

V.02/1 Decree on the Emission of Substances and Heat in the Discharge of Wastewater from the Sources of Pollution Source, (O.J. RS No. 35/96)

V.04/1 Decree on the Emission of Substances in the Discharge of Waste Waters from Plants and Facilities for the Production, Processing and Treatment of Textile Fibers, (O.J. 35/96)

V.06/1 Decree on the Emission of Substances in the Discharge of Waste Waters from Plants and Facilities for the Production of Metal Products, (O.J. 35/96)

V.07/1 Regulations on the Initial Measurements and Operation Monitoring of Wastewater, and on the Conditions of Its Implementation, (O.J. 35/96)

V.13/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities from Chlor-alkali Electrolysis Industry, (O.J. 10/99)

V.14/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities for the Manufacture of Glass and Glass Products, (O.J. 10/99)

V.15/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities for Animal Husbandry, (O.J. 10/99)

V.16/1 Decree on the Emission of Substances in the Discharge of Waste Water from Gas Stations, Facilities for Maintenance and Repairs of Motor Vehicles, and Car-washes, (O.J. 10/99)

V.17/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities for the Manufacture of Vegetable and Animal Oils and Fats, (O.J. 10/99)

V.18/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities for Performing Health and Veterinary Services, (O.J. 10/99)

V.19/1 Decree on the Emission of Substances in the Discharge of Waste Water from Installations for the Disposal or Recycling of Animal Carcasses and Animal Waste, (O.J. 10/99)

V.20/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants for the Manufacture, Processing and Canning of Meat and the Manufacture of Meat Products, (O.J. 10/99)

V.21/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities for Milk-processing and the Manufacture of Dairy Products, (O.J. 10/99)

V.22/1 Decree on the Emission of Substances in the Discharge of Waste Water from Breweries and Malt-houses, (O.J. 10/99)

V.23/1 Decree on the Emission of Substances in the Discharge of Waste Waters from Plants and Facilities for the Production of Cellulose, (O.J. 10/99)

V.24/1 Decree on the Emission of Substances in the Discharge of Waste Water from Plants and Facilities for the Manufacture of Paper, Cardboard and Paperboard, (O.J. 10/99)

V.Ffs/1 Decree on the Emission of Substances in the Discharge of Waste Water from the Manufacture of Phyto-Pharmaceuticals and Pesticides, (O.J. 84/99)

V.Nho/1 Decree on the Emission of Certain Dangerous Chlorohydrocarbons in the Discharge of Waste Water, (O.J. 84/99)

Table 1.1:Table of Legislation of RS on the CHC - the chlorine derivatives of methane and ethane with Emission Limit Values (ELV) for Emission into Water

FIELD	**WATER**																					
Legislation				**V.02/1**	**V.04/1**	**V.06/1**	**V.13/1**	**V.14/1**	**V.15/1**	**V.16/1**	**V.17/1**	**V.18/1**	**V.19/1**	**V.20/1**	**V.21/1**	**V.22/1**	**V.23/1**		**V.24/1**		**V.ffs/1**	**Vnho/1**
	Substance	**Discharge**	Unit														**exist.**	**new**	**exist.**	**New**		
	AOX	**direct**	**mg/l**	**0,5**	**0,5**	**1,0**	**0,5**	**0,5**	**0,1**	**0,1**	**0,5**	**1,0**	**0,1**	**0,1**	**0,1**	**0,5**	**/**	**/**	**/**	**/**	**10**	**/**
		indirect	**mg/l**	**0,5**	**0,5**	**1,0**	**1,0**	**0,5**	**0,1**	**0,1**	**0,5**	**1,0**	**0,5**	**0,5**	**0,5**	**0,5**	**8,0***	**0,5-1,5***	**0,03-0,07***	**0,01-0,07***	**10**	**/**
	HVCHC	**direct**	**mg/l**	**0,1**	**0,1**	**0,1**	**/**	**/**	**/**	**0,1**	**/**	**0,1**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**0,1**	**/**
		indirect	**mg/l**	**0,1**	**0,2**	**0,1**	**/**	**/**	**/**	**0,1**	**/**	**0,1**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**0,1**	**/**
	other derivates of CH_4 and C_2H_6			**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**CCl_4** **EDC** **TRI** **PER** $CHCl_3$
	other CHC substances			**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**/**	**Y**	**Y**

Table remarks: * **-** not in mg/l but kg of AOX / ton of Produced Air Dry Cellulose, **ffs** - Phyto-Pharmaceuticals and Pesticides, **nho-** Certain Dangerous Chlorohydrocarbons, **AOX –** Adsorptive Organic halogens, **HVCHC –** Highly Volatile Chlorinated HydroCarbons, CCl_4 -Tetramethane, EDC – 1,2-Dichloroethane, TRI – Trichloroethylene, PER- Tetrachloroethylene, $CHCl_3$ – Trichloromethane, exist. – existing industrial plants, new – or new or reconstructed industrial plants, direct - direct emission into the water environment, indirect - indirect emission into the sewer, Y- yes - See Table 5.1

Slovenia (2) FIELD: AIR

Z.02/1 Decree on Limit Values, Alert Thresholds and Critical Imission Values for Substances Emitted into Atmosphere, (O.J. 73/94)

Z.03/1 Decree on the Emission of Substances into Atmosphere from Stationary Sources of Pollution, (O.J. 73/94)

Z.03/2 Decree on Changes and Additions to the Decree on the Emission of Substances into Atmosphere from Stationary Sources of Pollution, (O.J. 68/96)

Z.17/1 Regulations on the Initial Measurements and Operation Monitoring of the Emission of Substances into Atmosphere from Stationary Sources of Pollution, and on the Conditions of Its Implementation, (O.J. 70/96)

Z.18/1 Decree on Handling Substances Depleting the OZONE Layer, (O.J. 70/97)

Table 1.2: Table of Legislation of RS on the CHC - the chlorine derivatives of methane and ethane with Emission and Imission Limit Values for Emission in Atmosphere

FIELD	***AIR/ Atmosphere***			
Legislation			**Z.03/1**	**Z.02/1**
	SUBSTANCE	**Unit**	**ELV**	**ILV**
	CH_2Cl_2	**mg/m^3**	**150**	**3 (24h)**
		kg/h	**3**	**/**
	1,1,1-trichlorethane	**mg/m^3**	**100**	**/**
		kg/h	**2**	**/**
	Trichloroethylene	**mg/m^3**	**100**	**1 (24h)**
		kg/h	**2**	**/**
	Tetrachloroethylene	**mg/m^3**	**100**	**5 (24h)**
		kg/h	**2**	**/**
	CCl_4	**mg/m^3**	**20**	**/**
		kg/h	**0,1**	**/**

	1,2-dichloroethane	**mg/m^3**	**20**	**0,7 (24h)**
		kg/h	**0,1**	**/**
	other CHC substances	**mg/m^3**	**0,1-1**	**/**
		g/h	**0,5-5**	**/**

Table remarks: ELV – Emission Limit Values, **ILV –** Imission Limit Values

<u>Slovenia (3) FIELD: SOIL</u>

T.01/1 Decree on Input of Toxic Substances and Plant Nutritions into the Soil, (O.J. 68/96)

T.02/1 Decree on the Limit, Warning and Critical Imission Values of Toxic Substances in Soil, (O.J. 68/96)

T.03/1 Regulations on the Initial Measurements and Operation Monitoring of the Emission of Toxic Substances and Plant Nutritions into the Soil, (O.J. 55/97)

Table 1.3: Table of Legislation of RS on the CHC - the chlorine derivatives of methane and ethane with Emission and Imission Limit Values for Imission in the Soil

FIELD	**SOIL**				
Legislation			**T.02/1**		
	Substances	Unit	ILV		
			LV	WV	CV
	other CHC substances ffs	mg/kg#	0,01-0,1	0,6-3	1-6

Table remarks: ELV – Emission Limit Values, ILV – Imission Limit Values, # - mg of Substance/ kg of Dry Soil, LV- Limit Value, CV - Critical Value, WV-Warning Value, ffs - Phyto-Pharmaceuticals and Pesticides

2. Authorities and legal bodies

Table 2	2a) Which authorities are competent to issue a licence or a permit for industrial plants using chlorinated hydrocarbons?	2b)Which authorities/institutions are competent for inspection of such plants?	2c) Which authorities are competent for monitoring of such plants?	2d) Which authorities/institutions are competent for the enforcement of regulations?
Austria	Regional level: Governeur of the Province Local level: Bezirkshauptmannschaft (district office) Comments: possibility to appeal against a licence-decision to the next level of administration	The same as in row a)	The same as in row a)	The same as in row a)
Cyprus	no	no	no	National authority see comments
Czech Republic	National level: Ministry of Environment (CCl_4, CH_3CCl_3) Regional level: Loeal Autthorities (the rest)	National level: Czech Environmental Inspectorate (CEI) Regional level: Local Authorities (LA)	The same as in row b) Comments: Only in the water protection	The same as in row b)
Estonia	National level: Ministry of the Environment Regional level: County Department of Ministry	National Level: Environmental Inspectorate Regional Level: Regional Departments of Inspectorate (but they are not a seperate institution) Local level: Local (Municipal) Gouvernment	Local level: Environmental Research Centre Regional level: Regional Environmental Laboratories	National authority: Environmental Inspectorate and Courts

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Germany, Saxony	Regional level: Regierungspräsidium (3), Local level: Landkreise/Kreisfreie Städte	Regional level: StaatlicheUmweltfachämter (SUFÄ)	Regional level: StUFÄ/privat institutions (after approval procedure)	National authority: Federal Government, Bundesländer (water),
Hungary	National level: Ministry of Environment Protection National Insprectorate for Environment Regional level: Regional Environmental Inspectorates	Regional level: Regional Environmental Inspectorates	Regional level: Regional Environmenatal Inspectorates, Regionals water Authority	Regional authority: Regional Environmenatal Inspectorates
Ireland	National level: EPA and Loacal Authority	National level: EPA and Loacal Authority	National level: EPA and Loacal courts	Regional authority: EPA through Courts
Italy	Comments: All industries are subject to santary and environmental authorization	National level: National Agency for Protection of Environment (also ecological squad of Carabinieri) Regional level: Regional Agency for Protection of Environment Local level: Prevention the Partment of Sanitary Company	Regional level: Regional Agency for Protection of Environment Local level: Provincial Departement of ARPA	Regional authority: Regions Local authority: Provinces and Municipalities
Latvia	Comments: IPPC Regulations/ Draft	National level,: Environmental State Inspectorate Regional level: Regional Environmental Boards Local level: Self-monitoring of Enterprises	Local level: Self-monitoring of Enterprises	National authority: Environmental State Inspectorate Regional authority: Regional Envrionmental Boards, Local authority: Municipalities

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Lithuania	Regional level: Regional Environmental Protection Department	National level: State Environmental Protection Inspection Regional level: Regional Environmental Protection Department Local level: City Environmental Protection Agenutre Comments: Usually inspections are made by inspectors of City Environmental Protection Agenture	National level: Join Research Center of Environmental Ministy of Republic of Lithuania Regional level: Regional Environmental Protection Department Comments. There are 8 Regional Environmental Protection Departments and each of them has the laboratory for making state monitoring. Joint Research Center helps for regional labs if they have not enough equipment.	National authority: Environmental Ministry and State Environmental Protection Inspection Regional authority: Regional Environmental Protection Department
Portugal	Regional level: five Regional Departments of Ministry of Economy	National level: Inspectorate General of Economy Activites and the Directorate General of Customs. Regional level: there are five Regional Departments of Ministry of Economy	Regional level: five Regional Departments of Ministry of Economy	National level: there are the Directorate General for Industry and the Inspectorate General for the Environment. Regional level: there are five Regional Departments of Ministry of Economy

Table 2	2a) Which authorities are competent to issue a licence or a permit for industrial plants using chlorinated hydrocarbons?	2b)Which authorities/institutions are competent for inspection of such plants?	2c) Which authorities are competent for monitoring of such plants?	2d) Which authorities/institutions are competent for the enforcement of regulations?
Romania	National Level: Ministry of Waters, Forests and Environmental Protection (MWFEP) Regional and local level: Territorial Environmental Protection Agencies (TEPA) Comments: The IPPC Strategy (for the implementation of the IPPC Directive 96/61/EC) provisions: => 2003-for new activities, => 2005 for existing activities	The same like lit. a) Comments: Ministerial Order No 125 on the approval of the procedure to regulate the activities with environmental impact establishes the competence in permits issuing	The same like lit. a)	Natioal level: MWFEP
Slovak Republic	National level: Ministry of Environment Regional level: District offices	National level: Slovak Inspectorate of Environment Regional level: District offices	National level: Slovak Inspectorate of Environment and authorized measurement groaps 5 groups are approached to measure concentration of CHC in emission	National authority: Slovak Inspectorate of Environment Regional authority: District offices
Slovenia	National level: Ministry of the Environment and Spatial Planning (MESP) and Administration of the Republic of Slovenia for the Protection of Nature (ARSPN) Local level: Local Goverment Units (LGU)	National level: Inspectorate of the Republic of Slovenia for the Environment and Spatial Planning (IRSESP), Market Inspectorate of the Republic of Slovenia (MIRS) and Customs Administration of the Republic of Slovenia (CARS)	National level: Authorized Companies and Institutions	National level: IRSESP and MIRS, CARS

Table 2	2a) Which authorities are competent to issue a licence or a permit for industrial plants using chlorinated hydrocarbons?	2b)Which authorities/institutions are competent for inspection of such plants?	2c) Which authorities are competent for monitoring of such plants?	2d) Which authorities/institutions are competent for the enforcement of regulations?
Sweden	National level: Supreme Environmental Court (Issue permits on 500 tonnes or more per year) Regional level: County Administrative Authorities (Issue permits concerning 5-500 tonnes per year) Local authority: Dry cleaners. Installations handling 500 kg -5 tonnes. (Notification)	National level: SEPA supervises the inspection on regional and local levels Regional level: County Administrative Authorities The inspection task may be delegated to the local level: Municipal Administrative Authorities	Regional level: County Administrative Authority Local level: Municipal Administrative Authority Comments: Operator self monitoring is compulsory and stated by law	National authority: SEPA Regional authority: County Administrative Authority Local authority: Municipal Administrative Authority Comments: The police and the Enforcement Service Authority are involved concerning environmental crime
United Kingdom	National level and Rgional level: Environment Agency mainly through IPC	The same like lit. a)	The same like lit. a)	The same like lit. a)

Comments:

Cyprus: The Ministry of Labour and Social Insurance is responsible for the enforcement of the Atmospheric Pollution Control Law No 70/91 and the Ministry of Agriculture, Natural Recources and Environment is responsible for the Water Pollution control Law No 69/91. Law 70/91 indirectly covers the use of chlorinated hydrocarbons. Law 69/91 regulates the discharge of liquid effluent including halogenated organic compounds in general. More speifically, this law requires the user to apply for permit to discharge such effluent. The permit is issued under conditions including disposal site and concentration limits for the effluent.

3. Chlorinated Hydorcarbons

3a) Which chlorinated hydrocarbons are prohibited in your country for use in industrial plants?

Table 3a	Tetrachloromethane		1,1,1-Trichloroethane		Other	
	Prohibited since	Exception possible	Prohibited since	Exception possible	Prohibited since	Exception possible
Austria	1992	yes	1995	yes	-	--
Cyprus	-	-	-	-	-	-
Czech Republic	1996	yes	1996	yes	-	-
Estonia	1999	yes	1999	yes	Hexachlorobenzene since 1999	Yes
Germany, Saxony	01.03.91 (allowed in industrial plants which need a permit)	no	1993 (allowed in industrial plants which need a permit)	yes	-	-
Hungary	-	-	1996	no	All CFC's and halons since 1996	No
Italy	1993 in new plants *)	yes	1993 in new plants*)	yes	Hexachloroethane since 1998**)	Yes
Ireland	-	-	-	-	-	-
Latvia	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-
Portugal	-	-	-	-	-	-
Romania		yes		yes	-	-
Slovak Republic		yes		yes		
Slovenia	1996	yes	1996	yes	Trichloromethane, 1,2 Dichloroethaneand and some other CHC substances since 1996	Yes

Table 3a	Tetrachloromethane		1,1,1-Trichloroethane		Other	
	Prohibited since	Exception possible	Prohibited since	Exception possible	Prohibited since	Exception possible
Sweden	1993	yes	1995	yes	Dichloromethane since 1995 Trichloroethylene since 1993 Tetrachloroethylene since 1993 (for household use) Carbontetrachloride since 1993 Hydrochlorofluorocarbons HCFC since 1994 Chlorofluorocarbons since 1991, since 1995 in dry-cleaning Halon (1211) since 1991	Yes
United Kingdom	1994	Yes	1994	Yes	Many CHCs prohibited since 1994 – EC Decision to Implement The Montreal Protocol (94/68/EC)	

Comments:

Austria: According to the ordinance of the Federal Minister for Environment, Youth and Family concerning the prohibition of 1,1,1 - Trichlorethane and Tetrachloromethane (BGBl. No. 776/1992 amended with BGBl. II No. 461/1998) it is prohibited to substitute 1,1,1- Trichloroethane with Dichloromethane, Trichloroethylene or Tetrachloroethylene (some exceptions are possible). Moreover, operators who are allowed to use 1,1,1-Trichloroethane are obliged to notify the amount of used 1,1,1-Trichloroethane each year and to inform whether the above mentioned substances for substitution are used.

Cyprus: The above Chlorinated Hydrocarbons are not produced in Cyprus and all the quantities used are imported. The quantities imported are reduced every year, from 1995, according to the provisions of the Montreal Protocol on Substances that deplete the Ozone layer, and its amendment.

Czech Republic: CCl4 and CH3 CCl 3 are the subject of the Ozone Layer Protection Act. Their use is very limited by the act and by the regulations e.g. the import and the production of 500 kg CCl4 and 150 kg CH3CCl3 was allowed in the year 1999, but the use should have been only for the research.

Germany: The possibility to get an exception is not used!

Hungary: The so called „hard“ freons (CFC‘s), halons, carontetrachlorids (CTC) and the 1,1,1 trichloroethane (or methilchloroform MCF) have been phasedout in Hungary in 1996, based on our Ministeral decree 22/1993, and in accordance with the Coppenhagen Amendments of the Montreal Protocol.

Ireland: Will revert with Information when available

Italy: *) use allowed until 31/12/2008 in existing plants,**) use allowed according to D.M. 12/08/98 No 39 of the enclosure

Latvia: Regulations on protection of ozone layer prohibit production an import of certain chlorinated CHC but not use of them. Draft of „regultations on prohibitions limitations or restrictions on the handling, use and marketing of certain dangerous substances“ restrict use of certain CHC

Lithuania: There are no CHC in Lithuania wich using are prohibited. Regulation of using CHC is making du ring licencing procedure for import CHC in Lithuania.

Portugal: Decree Law no 264/98 of 19 August 1998 (transportation of these Directives 94/60/EC of 10 April 1997, concerning limitations for the commercialization and usage of some hazardous substances), which limit the use of some chlorinated hydrocarbons such as 1,2-dichloroethane, chloroform, tetrachloride of carbon, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,1,1,2-tetrachloroethane, pentachloroethane, 1,1-dichloroethylene and 1,1,1-trichloroethane.

Romania: There are no prohibited CHC for the use in industrial plants; for CTC (Carbon Tetrachloride) nand 1,1,1 Trichlorethan there are ozone depleting substances and that are controled substances, there are restrictions on the use : - interdiction to eliminate into the air, - the obligatory recovery when these substances are use like solvents (Governmental Ordinance No 89/1999 (Article 11 (1), (2)); prohibited substances (controled ODS) : other CFC: (CFC -13; CFC-111; CFC-112; CFC-211; CFC-212; CFC-213, CFC 214, CFC 215, CFC 216 CFC 217)=> strong limite to use; HBrFC

Slovenia: Exeptions possible only in the case of Science, Research and Analytical Purposes.

Sweden: The authority to decide on application on exceptions of the prohibition is the Swedish Chemical Inspectorate. Such an exception is at high cost.

3b) Latest statistics of annual use of chlorinated hydrocarbons in your country

Table 3b	**Dichloromethane**		**1,1,1-trichloroethane**		**Trichloroethylene**		**Tetrachloroethylene**	
	Intended purpose	**Tons per year**	**Intended purpose**	**Tons per year**	**Intended purpose**	**Tons per year**	**Intended purpose**	**Tons per year**
Austria		680 (1996)		285 (1996)		290 (1996)		645 (1996)
Cyprus	Paint removers (mainly) Production of footware parts	193 (1998)		0	Degreasing of metal canisters Adhesives production	6 (1998)	Dry cleaning (mainly) Production of footware parts	54 (1998)
Czech Republic	This statistics will be known during this year							
Estonia	Data not available							
Germany, Saxony	Extraction, surface cleaning	426 (1996)	storage	2 (1996)	Cleaning of production	1,3 (1997)	Dry cleaning (> 1 t/a)	Ca. 5

Table 3b	Dichloromethane		1,1,1-trichloroethane		Trichloroethylene		Tetrachloroethylene	
	Intended purpose	Tons per year	Intended purpose	Tons per year	Intended purpose	Tons per year	Intended purpose	Tons per year
Hungary	Solvent use total in 1998: 35kt							
Ireland	Solvent in Tablet formulation, carrier for foam manufacture degreaser, paint stripper, dye carrier	not available		Not available		164 (1998)		375 (1998)
Italy	Paints Aerosol Chem. and pharm. Industries	4.050 14.850 26.100	Degreasing Chem. Industries	20.400 3.600	Dry cleaning Degreasing Chem. Industries	3.000 20.000 2.000	Dry Cleaning Degreasing Chem. Industries	30.000 12.000 1.000
Latvia	Syntheses of chemical substances and products	12,5			Solvent for cleaning and degreasing	85	Solvent for cleaning	60
Lithuania					0,02			
Portugal								
Romania				0,232 t imported 1998; 30 t produced in 1997				
Slovak Republic	-							

Table 3b	**Dichloromethane**		**1,1,1-trichloroethane**		**Trichloroethylene**		**Tetrachloroethylene**	
	Intended purpose	**Tons per year**	**Intended purpose**	**Tons per year**	**Intended purpose**	**Tons per year**	**Intended purpose**	**Tons per year**
Slovenia	Special use in PU production	*)	Degreasing agents	*)	Research and Analytical Purposes, Studies	0,022 (1998)	Degreasing agents	*)
Sweden	Paint removing / Pharmaceutical use	616	--	0	Degreasing / Vulcanization of rubber	1669	Dry cleaning	655
United Kingdom	Solvent/Degreasing	29.000 t/a	Solvent/ Degreasing	29.000 t/a	Solvent/ Degreasing	29.000 t/a	Solvent Degreasing/dry cleaning	7000 t/a

Comments:

Cyprus: The examples given above do not cover all intended purposes

Czech Republic: This statistics will be known during this year (2000).

Hungary: No exact consumption data from each solvents. However acc. to our estimation about 1/5 th of the total solvent use originates form the technology of cleaning and degreasing, I.e. about 7 kt in 1998.

Ireland: All other saturated and unsaturated Chlorinated acyclic hydrocargons 2,970 tons per year (1998); none manufactured in Ireland

Italy: Dichloropropane: Dry cleaning 3.000 tons per year, paints 24.000 tons per year, Chem. Industries 3.000 tons per year This situation is related to period 1983 – 1985

Lithuania: We haven't any more statistics about of mentioned CHC

Portugal: The data is only available by halogenated organic compounds in our National Statistic Industry.

Romania: Only for those CHC that are ODS there are realistic statistics: 1998: $CCl_{4production}$: 9509 t (7737t exported as 'feedstock'); annual consumption : ~ 100 t (stock remained – not used; 1998: 1,1,1 Trichloroethane : 0,232 t imported; 1997: 1,1,1 Trichloroethane: 29 t produced by a company that had stopped the activity

Slovenia: *) Collecting Data and Information from Industry Sector. EU legislation on this field was just adopted an IRSESP is collecting information's on this field at the moment. CCl_4 Research and analytical Pursposes, Studies 0,06 tons per year 1998

Sweden: The statistics refer to the year 1998.

4. Air emission limit values

4a) Which air emission limit values apply for the use of chlorinated hydrocarbons in industrial plants?

Table 4a(*)	T CHC	T CHC as Cl	DCM	TCE	TRI	PER	Other
Austria	100<50g/h; 20>50g/h hhav		-	-	-	-	-
Cyprus	-		-	-	-	-	Other total hydrocarbons:100mg/Nm^3 max.at any time for certain uses
Czech Republic	-		150 dav	-	20 dav	20 dav	20 dav: 1,2- Dichloroethane, Trichloromethane 100 dav: 1,1- Dichloroethane 150 dav: 1,2-Dichloroethylene, Chloroethane
Estonia	-	-	-	-	-	-	-
Germany, Saxony	20 hhav		50 hhav		20 hhav	20hhav	
Hungary	-		-	-	-	-	-
Ireland	20 – 100 dav		20 dav	100 dav	100 dav	100 dav	
Italy	-		total discharge >100g/h 20 mg/m^3	total discharge >2000 g/h 150 mg/m^3	total discharge >100 g/h 20 mg/m^3	total discharge >100 g/h 20mg/m^3	Carbon Tetrachloride: total discharge: >100g/h (20mg/m^3) Dichloropropane: total discharge >2000g/h (150 mg/m^3)
Latvia *)	-		8,8 hhav *)	-	1,0 dav *) 4,0 hhav	0,06 dav *) 0,5 hhav	Dichloroethane: 0,7 dav, 3,0 hhav *) Trichloromethane: 0,03 dav, 0,1hhav *)
Lithuania *)	-		3 dav *) 8,8 hhav	1 dav *)	1 dav *) 4 hhav	0,06 dav *) 0,5 hhav	Dichlorethane: 1 dav; 3 hhav *) Tetrachloromethane: 0,7 dav, 4 hhav *)
Portugal	-		-	-	-	-	-
Romania			150 dav * 3 g/h	20 dav 0,1 g/h	100 dav 4 hhav	100 dav 2 g/h	Tetrachloromethane: 20 dav, 0,1 g/h Trichloromethane: 20 dav, 0,1 g/h

Table 4a(*)	T CHC	T CHC as Cl	DCM	TCE	TRI	PER	Other
					2 g/h		1122 Tetrachloroethane, Chlormethane: 20 dav 2 Chlor 1,3 Buthadiene: 100 dav
Slovakia	-		-	-	-	-	-
Slovenia	-	-	150 hhav (>3 kg/h)	100 hhv (>2 kg/h)	100 hhv (>2kg/h)	100 hhv (>2kg/h)	0,1 hhav (>0,5g/h) Vinylchloride 20 hhav (>0,1kg/h): Chloromethane, 1,2-Dichloroethane, 1,1,- Dichloroethylene, Trichloromethane, 1,1,2 – Trichloroethane, Tetrachloromethane, 1,1,2,2,-Tetrachloroethane 100 hhav (>2 kg/h): 1,1-Dichloroethane 150 hhav (>3kg/h): 1,2-Dichloroethylene
Sweden	-		-	-	-	-	-
United Kingdom	50 dav 7500 t/a 20000 t/a	6000 t/a 16.000 t/a	3600 t/a 9000 t/a	3.5 t/a 9 t/a	1300 t/a 3300t/a	340 t/a 850 t/a	1,2-Dichloroethane: 1. 1900 t/a, 2. 4800 t/a Chloromethane: 1. 1900 t/a, 2. 4800 t/a

(*)Table 4a – Explanations: **(average) values:** dav = daily average value (mg/m^3), hhav = half hour average value (mg/m^3), tdis = total discharge, (other values)
T CHC = total CHC, DCM = Dichloromethane, TCE = Trichloroethane, TRI = 1,1,1-Trichloroethylene, PER = Tetrachloroethylene

Comments:

Cyprus: These uses include metal surfaces and furniture painting, lacquering and also production of footware parts.

Estonia: No general emission limit values -> set in permits case by case

Hungary: For techniques listed in Annex II A of the VOC directive of EU, we adopted the same elv. For compunds not – not applicable for the techniques above, the elv of TA – Luft will be applied.

Germany: *) dry cleaning: 2g/m³ at the exit of the treatment devise, surface treatment, 1g/m³ at the exit of the treatment devise**) 0,1 mg/m³ in Nachbarräumen – weekly average

Hungary: For techniques listed in Annex IIA of the VOC directive of EU, we adopted the same elv. For compounds – not applichable for the techniques above, the elv- of TA-luft will be applied.

Ireland: Usually do not have total discharge limite applied

Italy: Carbon Tetrachloride > 100 g/h other value 20 mg/m³, Dichloropropane >2000 g/h other value 150 mg/m³

Latvia : *) Immission limit values are indicated; Total discharge is stipulated by the authorities in relation to the ILV. Total discharge is different for different plants => depends on local conditions

Lithuania: *) Immission limit values are indicated; Total discharge is stipulated by the authorities in relation to the ILV. Total discharge is different for different plants => depends on local conditions

Portugal The air emission limit values are defined on the Portaria no 286/93 of 12 Marth 1993 and for these compounds there is the parameter „organic compouds in total carbon –50 mg/m³N". The Directive 1999/13/EC of 11 March 1999 concerning limitations on the emissions of volatil organic compounds from the usage of organic solvents in specific activities and installations, will be transported. After the another measures will be implemented.

Romania: Regulation: Ministerial Order No 462/1993 on the pproval of technical conditions for the atmosphere protection and the metodology on the air emissions determination for stationary sources

Slovak Republic: The only air emissions limit values for using of chlor. HC are quoted in the table c) page 2

Slovenia: Permanent Operation Monitoring of the Emission of Substances into Atmosphere from Stationary when Limit Values are Exceeded

Sweden: The above mentioned chlorinated hydrocarbons are prohibited. The only exception is tetrachloroethylene.

UK: 1. Reported emissions from IPC processes in 1998, 2. Likely total emissions

4b) Do refernece conditions apply for limit values?

Table 4b	Temperature	Pressure	Dry	Other	Comments
Austria	0° C	1013 hPa	No, wet	-	
Cyprus	0° C	1013mbar	0 % humidity	% Oxygen content in flue gases	
Czech Republic	0° C	101,325 kPa	no	-	
Estonia	-	-	-	-	Temperature is set in permits case by case
Germany, Saxony	0° C	1013 mbar	Yes	-	dry cleaning: the reference temperatrure is 308 K
Hungary	*)	*)	-	-	See defination of VOCs in the VOC directive of EU: at 293, 15 K: at least 0,01 k Pa
Ireland	0° C	101,3 kPa	No correction ...		
Italy	0° C	1013mPa	yes		
Latvia	no				
Lithuania				Local conditions	These conditions apply during recalculation measures to the standard conditions
Portugal	293 K	101,3 kPa			
Romania	-	-	-	The debit; maximum exploitation conditions	Values are not available if: => the debit is higher than specified one more than 8 hours in a week; => the debit is equal to a double one or higher
Slovak Republic	0° C	101,325 kPa	At now sources	Wet at existing sources	
Slovenia	0°	101,3 kPa	Dry gas		If Calculated Value of O_2 in Emission Gases is specified, then Measured Emission Values are Recalculated with Specified O_2 Percentage: Heating Plants (Gas and Fuels 3%, Coals 7%, Wood and Biomaterial 13%) Incinerators (Gas and Fuels 3%, 11% Incinerators up to 750 kg of Waste/h and 17% Incinerators below 750 kg of waste/h)
Sweden	-	-	-	-	

Table 4b	Temperature	Pressure	Dry	Other	Comments
United Kingdom	0° C	101.3 kPa	No - without correction for water vapour content		

4c) Are the fugitive emissions considered?

Table 4c	yes/no	Specify how they are limited	Specify how they are calculated
Austria	no		
Cyprus	yes	In the case of the Cyprus Petroleum Refinery they are incinerated.	
Czech Republic	yes	They are not limited	From the mass balance
Germany	yes	Dry cleaning: enclosed devices; the concentration must be down to 2 g/m³ before opening the drying maschine Degreasing installations: enclosed devices: the concentration must be down to 1 g/m³ before opening	The fugitive emissions are not calculated
Hungary	yes	either by process integrated measures (e.g. paints with less solvent content) or by closed techniques (e.g. update closed degreasers).	By mass balance, see „solvent management plan“ of VOC directive of EU (Annex III).
Ireland	yes		Usually by mass balance or by a once off practical ceck
Italy	yes	From 1997 all emission must be collected	
Latvia	no		
Lithuania	yes	Each source has limited value for each pollutant g/s. Limit values are decided after modeling.	
Portugal	no		
Romania	yes VOC	The transposition of VOC directive (1999/13/EC)in legal framework have to be finished till 2003; total implementation is estimated for 2015; the Ministerial Order No 462/1993 on technical conditions for the atmosphere protection needs to be amended	

Table 4c	yes/no	Specify how they are limited	Specify how they are calculated
Slovak Republic	yes	At the operation of any source of air pollution it is necessary to keep „general conditions for operation". By keeping „gernarl conditions for operating" fugitive emissions are controled.	To my knowlege there is no any „specific system of calculation"of fugitive emissions
Slovenia	yes	Fugitive emissions are limited by Imission values, which are specified for certain CHC: 1,2 –Dichloroethane(limit value 0.7 mg/m3 for 24 MTP) , Dichloromethane (limit value 3 mg/m3 for 24 MTP), Tetrachloroethylene (limit value 5 mg/m3 for 24 MTP) and Trichloroethylene (limit value 1 mg/m3 for 24 MTP), MTP –measured time period	Transform calculation Factors for from PPM (parts per million) to mg/m3 at (T=273K, 101,3 kPa and Dry air): 1,2 –Dichloroethane 4,12, Dichloromethane 3,47, Tetrachloroethylene 6,78, Trichloroethylene 5,4
Sweden	yes	By issuance of guidance notes on BAT (for example concerning dry cleaners). By ensuring hygienic limits on threshold values	
Uited Kingdom	yes	In some cases – as part of the Authorisation	By calculation of mass balance differences and by the use of LIDAR Techniology

Comments:

Portugal: The air emission limit values are considered only for fixed sources

4d) Are air emission limit values fixed in regulations or in the single licence?

Table 4d	Fixed in regulations	Single licence	comments
Austria		X	
Cyprus		X	Air emission limit values are fixed in each licence for the process covered by the Atmospheric Pollution Control Law No 70/91
Czech Republic	X		Regulation of Ministery of Environment No 117/97, setting forth Emission Limit values
Estonia		X	
Germany	X	X	The emission limits in single linceses could be stronger than in the regulation

Table 4d	Fixed in regulations	Single licence	comments
Hungary		X	The general regulations was mentioned in 1/C an 4/a. Nevertheless the Regional Env. Inspectorate has right to prescribe more strict elv based on the special situation of the polluter: e.g. densily populated area, if the company is close to hospitals etc. In these cases the ambient air quality (immission) is relevant.
Ireland		X	Emission limit Values are specified for each discharge point
Italy		X	According to DM 12.07.90 regional guide lines exist and every single licence states emission limit values
Latvia	X	X	Regulations on the air quality, in future: law on pollution/at present - draft
Lithuania	X	X	Each enterprise has permit for using natural resources, where are written limit values for each pollutant g/s and t/year, and these limit values are different for each enterprise. Limit values for ambient air are the same in all Lithuania.
Portugal	X		The air emission limit values are fixed in regulations not in permit
Romania	X	X	Competent authority establishes a “Programme of Conformity”, according to the licence obtaining procedure . Suppllementary air emissions values can be fixed, taking into account the environmental impact study and the activity
Slovak Republic	X		Limit values in the licence are taken form regulations (laws)
Slovenia	X		
Sweden		X	
United Kingdom		X	Fixed through the Licence (according to BPEO/BATNEEC considerations and site specific factors

5. Waste water emission limit values

5a) Which water emission limit values apply for the use of chlorinated hydrocarbons in industrial plants

Table5a(*)	CHC	CHC – as Cl	TCE	TRI	PER	AOX	POX	Other
Austria	-	0,1 mg/l	-	-	-	0,5 mg/l*	0,1 mg/l*	-
Cyprus	-	-	-	-	-	-	-	-
Czech. Rep.						0,5-2,0 mg/l		
Estonia	1,0 mg/l							
Germany, Saxony							0,5 –1,0 mg/l	
Hungary								$0{,}05 \times 10^{-3} m^3/m^3$
Ireland	0,1 dav 2 mg/l *					1,0 mg/l		Organochlorine Pesticides: 0,003 mg/l
Italy	1			5 g/t tri – per processes	5 g/t tri-per processes 20 g/t tri-per processes			Trichloromethan: 40g/t with washing 5 g/t without washing
Lativa								TCM: 1,5 mg/l
Lithuania	-	-	-	-	-	-	-	-
Portugal				0,1 mg/l m 0,2 mg/l d (10 g/l Quality objectives)	0,1 mg/l m 0,2 mg/l d 10 g/l Quality objectives)			1,2- Dichloroethane (usage in the degreasing of metals): 0,1 mg/l m, 0,2 mg/l d, 10 g/l Quality objectives TCM: 12 g/l Quality objectives
Romania	-	-	-	-	-	-	-	-
Slovak Rep.	-	-	-	-	-	--	-	Total sum of voltaile CHC: 1 mg/l

Table5a(*)	CHC	CHC – as Cl	TCE	TRI	PER	AOX	POX	Other
Slovenia			prohibited	0,1-2,5 mg/l d 0,1 – 1,25 mg/l 5,0 g/t d 2,5 g/t m *	0,1 –0,2 mg/l d 0,05 – 0,1 mg/l m	0,1-10 mg/l	-	1,2-Dichloroethan: 0,1-5,0 mg/l d 0,1-2,5 mg/l m 5-10 g/t d 2,5-5 g/t m * Trichloromethan: 0,1-2 mg/l d 0,1-1 mg/l m Tetrachloromethan: 0,1-3mg/l d 0,1-1,5 mg/l m 20 g/t d 10 g/t m HVCHC: 0,1-0,2 mg/l
Sweden	-	-	-	-	-	--	-	-
United Kingdom	2,5 t/a 6,5 t/a	2,0 t/a 5 t/a	0,7 t/a 2 t/a	0,5 t/a 1,3 t/a	0,4 t/a 1.0 t/a	-	-	-

(*) Explanations: (average) values: dav = daily average value (mg/l), m = monthly, d = daily DCM: Dichloromethane, TCE: Trichloroethan, TRI: 1,1,1-Trichloroethylene, PER: Tetrachloroethylene, HVCHC: Highly Voltaile Chlorinated Hydrocarbons,

Comments:

Austria: *) Regulation for general limitation of wastewater-emissions into (running) water or public sewage systems (BGBl. Nr. 186/1996)

Czech Repbulic: Amount of CHC in waste water from industrial plants is mainly regulated by imission limit values in running water (rivers) ans surface water.

Germany: 0,5 mg/l dry cleaning, 1,0 mg/l degreasing of metal

Hungary: *Organic solvents not mixable with water:

Irland: * for discharging in sewerage systems) **via:** Tetra-Cl-Methane 1, 5 mg/l

Lithuania: Is written in Lithuanian regulations, that CHC can not be in the discharge water.

Portugal: The waste water emission limit values are defined on Decree Law No 236/98 of 1 August 1998, on Decree Law No 56/99 of 26 February 1999 (transportation of Directives: 86/280/EEC of 12 June 1986 and 88(347/EEC of 16 June 1998 and on Law No 390/99 of 30 September 1999 (transportation of these Directives: 86/280/EEC of 12 June 1986, 88(347/EEC of 16 June 1988 and 90/415/EEC of 27 July 1990).

Hexachlorobutadyene (usage in the installation) define values for each installation, TCM (usage in the installation) define values for each installateion

Slovak Republic: 1,0 mg/l total sum of volatine CHC

Slovenia: cf. Table 5.1

Sweden: use of chlorinated hydrocarbons are prohibited => except Tetrachloroethylene

United Kingdom: 1. Reported emissions from IPC processes in 1998, 2. Likely total emissions

Table 5.1 Emission limit values and emission limit factors for certain CHC in Waste Water in industrial plants

Substances	**CONC. VALUES emission limit value**		**TOTAL DISCHARGE emission limit factor**		**if other values, please specify and fill in**
	(mg/l)		**(g/t)**		
	daily	**monthly**	**daily**	**monthly**	
CHC	/	/	/	/	
CHC as Cl	/	/	/	/	
Dichloromethane	/	/	/	/	
Trichloroethylene (TRI)	0,2 1,0 2,5	0,1 0,5 1,25	/ 5,0 5,0	/ 2,5 2,5	Use as degreasing agent Production TRI and PER Production CCl4 and PER
1,1,1-Trichloroethane	a	a	a	a	
Tetrachloroethylene (PER)	0,2 0,1	0,1 0,05	/ /	/ /	Use as degreasing agent Production of CFC

Substances	**CONC. VALUES emission limit value**		**TOTAL DISCHARGE emission limit factor**		**if other values, please specify and fill in**
	(mg/l)		**(g/t)**		
	daily	**monthly**	**daily**	**monthly**	
AOX	b	b	b	b	
POX	/	/	/	/	
HVCHC	b	b	b	b	
Trichloromethane CHCl3	2,0 2,0 0,1 0,1 0,1	1,0 1,0 0,1 0,1 0,1	20 15 / / /	10 7,5 / / /	Production of Chloromethane 1 Production of Chloromethane 2 Production of CFC Use as a solvent Use in manufacturing
1,2-Dichloroethane (EDC)	2,5 5,0 2,0 0,2 0,1 1,0	1,25 2,5 1,0 0,1 0,1 0,5	5 10 5 / / 5	2,5 5 2,5 / / 2,5	Production of EDC only Production and manufacturing of EDC Manufacturing of EDC except in VC Use as degreasing agent Use as a solvent Use in production in ionic exchangers
Trichloromethane CCl_4	3,0 0,1	1,5 0,1	20,0 /	10,0 /	Limit Values implemented by Directive EEC 76/464 and EC 86/280, also prohibited

Substances	CONC. VALUES emission limit value		TOTAL DISCHARGE emission limit factor		if other values, please specify and fill in
	(mg/l)		(g/t)		
	daily	monthly	daily	monthly	
	0,1	0,1	/	/	

Table remarks: a – prohibited, b – See Table 1.1, CHC = total sum of each chlorinated hydrocarbon halogens, HVCHC – Highly Volatile Chlorinated HydroCarbons, VC – Vinychloride, g/t - grams of Certain CHC per tone of produced/used (or other defined) product/production capacity, daily / monthly - daily or monthly averaged limit values.

5b) Are water emission limit values fixed in regulation or in the single licence?

Table 5b	Fixed in regulation	Single licence	comments
Austria	X		
Cyprus		X	No applications for liquid effluents containing CHC have been submitted so far. If such cases arise, concentration values will be considered by the licencing Authority
Czech Repbulc	X		Emission and imission limit values are specity by Regulation No. 82/99.
Estonia	X		
Germany	X	X	Regulations: minimum standards, single license: stronger local limits
Hungary	X		Effluent standards fixed in No 3/1984 (N.7) National Rivers Authoritids Order
Ireland	X	X	ELV‘s are set for emission point in licence but some are bythe Daughter Direction of 76/464/EE6
Italy	X		
Latvia	X		Regulations on water use permits
Lithuania	X	X	Each enterprise has its own limit values for three main pollutants, but not for CHC
Portugal	X		And they are fixed in the waste water discharge permits. These permits are reviewed at least every four years.
Romania	X	X	Limit values can be fixed in licence

Table 5b	Fixed in regulation	Single licence	comments
Slovak Republic	X	X	No 242/93 Government order of SR By which are established indices of the administrative degree of water pollution but most are fixed in the single licence.
Slovenia	X		see Table 1.1. under point 1. Legal Background
Sweden		X	
United Kingdom		X	Fixed through the licence according to BPEO/BATNEC considerations

6. Measures to prevent contamination of soil or groundwater

6a) Which measures are applied?

Table 6a	Bunding/collection device/catsch basins or similar	Enclosed plants	Barrier Layer / underground	Leak detection systems	Other
Austria	For CHC-tanks, machinery and tubings	Only in colsed machinery	-	For storage of CHC in tanks (alternatively to catch basins)	-
Cyprus	Collection device at source followed by treatment or transport to central treatment plant	-	-	-	-
Czech Republic	-	-	Some great sites	yes	-
Estonia	-	-	-	-	-
Germany, Saxony	Catch basins for the whole liquid	All installations must be enclosed	Stainless steel or special films and coatings	-	-
Hungary	yes	-	-	Yes	-
Ireland	All tanks and drum storage areas must have > 40 % of largest tank or 25 % of total volume of containment available	Not usual	Bunded aress must be impervious to contents of Tanks/Drams usually lined concrete structures	-	-
Italy	-	-	-	-	-
Latvia	-	-	-	-	-
Lithuania	-	-	-	-	Visual observation
Portugal	yes	-	yes	yes	-
Romania	-	-	-	-	-
Slovak Republic	yes	-	yes	yes	-
Slovenia	Bunding or collection devices are provided at the industrial stations and big plants using CHC solvents	Enclosed circles at the plants which use Tetrachloroethylene as a substitute solvent for 1,1,1	-	-	-

Table 6a	Bunding/collection device/catsch basins or similar	Enclosed plants	Barrier Layer / underground	Leak detection systems	Other
		Trichloroethane			
Sweden	By BAT Guidance Notes	By BAT Guidance Notes		By BAT Guidance Notes	By BAT Guidance Notes
United Kingdom	Specified in the Authorisation	The same like first row	The same like first row	The same like first row	-

6b) Are there any threshold values for soil or groundwater contamination?

Table 6b	Soil concentration		Groundwater concentration		Soil leachate concentration	Other
	Concentration values	Consequences when exceeding	Concentration values	Consequences when exceeding		
Austria	10 mg/m^3 (0°C, 1013 hPa, wet) *)	Information of the authority ? remediation, monitoring	18 µgCHC/l **) 0,2 µg/l 1,1, Dichloroethene, 1,8 µg/l Tetrachloromethane, 6 µg/l 1,2, Dichloroethane; 6 µg/l Tetrachloroethene	-		
Cyprus	-	-	-	-	-	-
Czech Rep.	-	-	Not strictly determined	-	-	-
Estonia	mg/kg	remediation, monitoring	mg/l	remediation, monitoring	-	-
Germany, Saxony	4-400 mg/kg*	-	-	-	10µg/l	-
Hungaria	4-60	remediation	-	remediation	-	-
Ireland	-	-	-	-	-	-
Italy	20mg/kg DRV (industrial soil)		0.01mg/l (0,003 mg/l for Dichloroethane)			0,003 mg/l (not fit for human use)

Table 6b	**Soil concentration**		**Groundwater concentration**		**Soil leachate concentration**	**Other**
	Concentration values	**Consequences when exceeding**	**Concentration values**	**Consequences when exceeding**		
Lativa	-	-	-	-	-	-
Lithuania	For different pollutants different concentration	remidiation and monitoring	-	-	-	-
Portugal	-	-			-	-
Romania	-	-	-	-	-	-
Slovak Republic	0,1 mg/kg	10 mg/kg	1 µg/l	20 µg/l	-	-
Slovenia	Limit Value: 0,01-0,1mg/kg* Warning Value: 0,6-3 1mg/kg* Critical Value: 1-6 1mg/kg*		No specific regulation * 1,2 Dichloroethane 3 µg/l 1,1 Dichloroethylenene 30 µg/l Tetrachloromethane 2 µg/l Tetrachloroethylene 10 µg/l Trichloroethylene 30 µg/l			
Sweden	-				-	-
United Kingdom	Not known		Not known		Not known	

Comments:

Austria: * soil-gas concentration Regulation (BGBl.Nr. 865/!994), ** Regulation (BGBl. Nr. 502/1991)

Cyprus: Each case ist considered separately under the Water Pollution Control Law No 69/91 and groundwater or soil contamination limits are fixed accordingly.

Estonia: Limit values for HCH => groundwater –70µg/l; soil (living area) – 5mg/kg; soil (industrial area) –50mg/kg

Germany: depends on the use (industrial, agricultural)

Hungary: dutch list (adopted to the hungarian situations) is used.

Ireland: usually refer to Danish or Dutch Guidelines – not regular

Italy: * 0,03 mg/l for Dichloroethane (1) 0,003 mg/l for Dichloroetane; ** not fit for human use

Lithuania : There are regulations for concentration values in the soil and in the ground water the same in all republic.

Portugal: There is the Decree Law no 236/98 of 1 August 1998 which inslove the transportation of the Directive no 80/68/EEC of 17 December 1979 concerning the protection of groundwater. The protection of groundwater involve the prohibition of the discarge of chlorinated solvents directly into groundwater.

Slovenia: Soil concentration See Table 1.3., * mg of Substance/kg of Dry Soil; ** Limit values of some CHC for Periodical Chemical Measurements of Drinking Water used as Limit values for Groundwater

Sweden: Use of chlorinated Hydrocarbons are prohibited, except Tetrachloroethylene

6c) Measures and thresholds values are fixed in regulations or in the single licence or in guidelines

Table 6c	Fixed in regulation	Single licence	Guidelines	comments
Austria	X			
Cyprus		X		
Czech Republic	X			The groundwater protection ist determinated by the act Nr. 138/73.
Estonia	X			
Germany; Saxony	X			There ist no emssion allowed by the way installation – soil/groundwater, only one way is „possible“: installation – air- soil- groundwater
Hungary		X	X	we are going to fix these standards into a new government decree
Ireland		X	X	
Italy	X			See D.L. 152/99
Latvia				Draft: law on pollution
Lithuania	X		X	General measures are fixed in the environmental protection law and guidelines. Threshold values are fixed in the regulations.
Portugal				Measures are fixed in the waste water discharge permits and in the industrial permits. The IPPC Direcitve 96/61/EC of 24 Septmber 1996 will be tramposed in a short time its implementation shall be change the existing permits
Romania	X	X		

Table 6c	Fixed in regulation	Single licence	Guidelines	comments
Slovak Republic		X	X	
Slonvenia	X			see Table 1.3 under point 1. Legal Background
Sweden		X		
United Kingdom		X		Fixed through the Licence according to BPEO/BATNEC

7. Measures to avoid fugitive (=diffuse, uncaptured) emissions

7a) Which measures are applied?

Table 7a	Air warning instruments	Enclosed plants	Barrier layer / air	Leak detection systems	Other
Austria	-	Enclosed machinery	-	-	-
Cyprus	-	-	-	-	-
Czech Republic	-	-	Some great sites	-	-
Estonia	-	-	-	-	-
Germany	Continous measurement equipement, the installation must be shut down, if the emissions are higher than the limits	Only enclosed installations are allowed	Films, special coatings		
Hungary	Where spec. toxic substances are used	Generally this option has preference		Additonal gasket rings have been used for HC storage tanks, out of the international floating roofs.	
Ireland	Ambient air monitores at locations on/off site		No-other than winter spray beoths in painting operations	Yes but sometimes manual systems	
Italy	-	-	-	-	-
Latvia	-	-	-	-	-
Lithuania	-	-	-	-	Visual observation
Portugal	-	-	-	-	-
Romania	-	-	-	-	-
Slovak Republic	-	-	-	yes	-
Slovenia	Incinerators: When temperature falls under set incineration temperature for more than is suitable for total decomposition of	Not for CHC. Dust and SO2 only		Only if they have permanent monitoring of CHC. Permanent monitoring of CHC is	

Table 7a	Air warning instruments	Enclosed plants	Barrier layer / air	Leak detection systems	Other
	waste into the nontoxic products. Only if they have permanent monitoring of CHC. Permanent monitoring of CHC is obligatory only if limit values are exceded.			obligatory only if limit values are exceded	
Sweden	yes	yes	yes	yes	yes
United Kingdom	Specified in the Authorisation*	The same	The same	The same	

Comments:

Hungary: The calculation written in ANNEX III of the new VOC directive of EU is being used in HungARY LONG AGO („solvent management plan")

Portugal: There isn't official mesures

Ireland: mass balance of solvents purchased Vs used and in product 2. Measurement of values at key representative pieces of equipment e.g. values – them extrapolate to site

UK: -for a given plant according as to whether special site specific considerations demand them

7b) Which methods of estimation and / or calculation of fugitive emissions are applied?

Table 7b	
Austria	-
Cyprus	-
Czech Republic	The mass balance
Estonia	according to material balance and certificates
Germany, Saxony	-
Hungary	The calculation written in Annex III of the new VOC direcitve of EU is being used in Hungary long ago („solvent management plan")

Table 7b	
Ireland	Mass balance of solvents purchased VS used and ind product, Measurement of values at key representative pieces of equipment e.g. values – than extrapolate to ste
Italy	-
Latvia	-
Lithuania	Measuring right in the emission source time by time controls fugitive emissions
Portugal	There isn‘t offiacial methods of estimation and/or calculation of fugitive emissions
Romania	Corinair method
Slovenia	-
Sweden	-
United Kingdom	Tighter control are currently being introduced in the UK e.g. reducing the number of release points and refrigeration of discharging for recovery and recycling.

8. CHC Waste

How are CHC residues from an industrial plant in your country usually treated

Table 8	Recycled	Incinerated	Chemical or phsical treatment	Other
Austria	X	X	X	
Cyprus	X			
Czech Republic	X (Destillation)	X		
Estonia	X			
Germany	By destillation and desorption of activated carbon	High temperature incineration (>1100 ° C)	Destillation, desorption	
Hungary	mostly	sometimes		
Ireland	In coating industry much of the dyes are removed and solvent recycled	Mainly off site (EU countries) or on-site		
Italy	X			
Latvia				Industrial enterprises are keeping CHC waste in their teritories
Lithuania				Lithuania hasn‘t any above mentioned systems for CHC treatment. It will be three stations for chlorflorhydrocarbons chemical treatment in the future.
Portugal	Recyled or Incinerated abroad			
Romania	Only for Carbontetrachloride, and in small quantities		X	
Slovak Republic	X	X		
Slovenia	Users (companies…) recycle either internally (enclosed circles) or externally (other company – Waste Processors): Dichloromethane, Trichloroethylene, Tetrachloroethylene	Waste Collector Companies collect waste CHC solvent mixtures from Users (companies…) and usually transport them in EEC countries for incineration.		

Table 8	Recycled	Incinerated	Chemical or phsical treatment	Other
	if it is economically justified. 1,1,1- Trichloroethane is not in industrial use any more, it is very rarely present even in industrial waste CHC solvent mixtures			
Sweden		X		
United Kingdom	X usual	X usual	X not usual	

9. Best available technology (BAT)

Table 9	Does a standard for best available technology (BAT) exist in your country	If so, does this standard serve as the basis for the permit of industrial plants using chlorinated hydrocarbons?	If so, are these standards compulsory or guidelines?	Comments
Austria	-	-	-	
Cyprus	No			
Czech Republic	No			
Estonia	No			
Germany	yes	yes	yes	
Hungary	no			
Ireland	yes	yes		
Italy	no	no	No	
Latvia	no	No	no	
Lithuania	no			Lithuania is in the stage of preparation for developing standard of BAT
Portugal	No			
Romania	-	-	-	
Slovak Republic	-			
Slovenia	no			
Sweden				BAT is compulsory according to the environmental legislation. There are BATguidance concerning dry cleaners. Other use of halogenated hydrocarbons is prohibited.
United Kingdom	no	No	No	BAT(NEEC) is site specific and there is no national standard for BAT

Comments:

Austria: There are guidelines for the experts of the authority, which they have to use in the proceedings for licence/permit for CHC-plants.

Germany: 2. Federal Immission Control Ordinance, Technical Instruction Air, Waste Water Ordinance, Drinking Water Ordinance, Soil Protection Ordinance

Hungary: Until now the BAT wasn't used, but the adoption of the new VOC directive of EU, also the principle of BAT will be adopted.

Latvia: in future: regulations on IPPC/at present – draft/and low on pollution/at present – draft/will determine the use of bat

Portugal: The IPPC Directive 96/61/EC of 24 September 1996 will be transposed in a short time its implementation shall be apply the BAT.

Slovenia : Only general comment in 8. of Environmental Protection Act (O.J. 32/93 and 1/96) defined as Principle of Prevention; Every activity must be planned and implemented in a way which will cause the least possible change in the environment; present the least environmental risk; minimize the consumption of space, raw materials, and energy during construction, production, distribution, and utilization to the greatest extent possible; include consideration of the principles of recycling and regeneration; and forestall or limit environmental impact from the start. (2) The implementation of the preceding paragraph stresses the use of the highest developed level of tested and proven concepts, equipment, and production methods

Sweden: The environmental legislation demands the use of BAT. BAT – guidelines are available (if not the use of a halogenated substance is fully prohibited (see above).

10. Cleaner Production

Please describe experiences in your country to introduce cleaner production technologies

Table 10	To use alternative substances	**To introduce alternative processes**
Austria	-	-
Cyprus	Certain plants producing footware parts changed their system of cleaning the parts from an open tank consuming around 6 tonnes/year 1,1,1-trichloroethane, to a closed system consuming 2 tonnes / year perchloroethylene	
Czech Republic	Using the detergents	Ultrasound
Estonia	-	-
Germany	Most of the metal degreasing installations use water based substances (tensides e.g.), hydrocarbons with a low vapour pressure	After the inforcement of the 2. Federal Immission Control Ordinance a lot of companies of the metal degreasing industry and the dry cleaning industry replaced the old devices. They ordered modern, stainless steel devices for the use of water based substances (degreasing) or low pressure hydrocarbons.
Hungary	With less or no CHC emission, e.g. in the field of using „powder coating“ instead of „CHC coating“ we have already very good experiences.	Using water borne paints technologies, using high solid painting technologies, using internal floating roofs for capture of CHC emissions from storage tanks
Ireland	See Attached	See attached
Italy	-	
Lativa	Have no experience regarding CHC	Have no experience regarding CHC
Lithuania	Some of enterprises starts use alternative substances or introduce alternative processes, because they pay for pollution, and new better technologies reduce pollutants.	
Portugal	If available will send you information about this subject	If available will send you information about this subject
Romania	-	-
Slovak Republic	In 1995 the civic association, NGO- Not for Profit organisation was founded. The name ist : cleaner Production Projectsaimed at env. protection, in introducing of ems systems in industriy etc.	

Table 10	To use alternative substances	**To introduce alternative processes**
Slovenia	Instead of Ozone Depleting Substances (ODS) CCl_4 and 1,1,1, Tetrachloroethane – both faced nearly industrial extinction- most of the factories either changed ODS with other less Ozone problematic CHC solvents (Trichloroethylene, Tetrachloroethylene) or other possible degreasing agents.	Alternative processes are combined with substitution of ODS Solvent, what practically means industrial use of enclosed circles for CHC solvents. Usually those enclosed plants provide recycling of solvents from other waste residues by cryogenic phase separation, which positively solves many problems with possible CHC vapours
Sweden	Example I: The use of Dichloromethane in pharmaceuptical industry to coat tablets (pills) with coating layer has been eliminated and replaced by environmental friendly, water based technology. This process has been developed by the pharmaceuptical industry in question. Example II: The use of Tetrachloroethylene by dry – cleaners has been replaced by water-based technology (wet-cleaning technique) and by technology using non halogenated solvents. In addition the use of Tetrachloroethylene by dry-cleaners has been reduced by new type of fully-closed machines where the emissions are eliminated. In parallell their has been an elimination of the use of CFC. This project where alternative techniques were developed for the dry-cleaning sector has been reported. The report by June 1997 is only available in the Swedish language. Example III: By swith to no-cleaning-technology in the electronic industry; and to aqueous systems in precision cleaning. Example IV: By switch to non-use of CTC in the chlor-alkali industry where it was used as a solvent for NCl3	
United Kingdom	Initiative to promote use of cleaner technologies (i.e.=> introduction of cleaner alternative substances and	See section a)

Table 10	To use alternative substances	**To introduce alternative processes**
	technologies) =the Environmental Technologies Best Practice Scheme => very successful in providing guidance on the alternatives available and on the likely benfits for env. and industry as a whole (e.g. to promote a green image, to have products that will meet the required purpose of use criteria without damaging the environment, and at times to save the industry money.	

Comments:

Sweden: Example I: The use of Dichloromethane in pharmaceuptical industry to coat tablets (pills) with coating layer has been eliminated and replaced by environmental friendly, water based technology. This process has been developed by the pharmaceuptical industry in question.

Example II: The use of Tetrachloroethylene by dry – cleaners has been replaced by witter –bowed technology (wet-cleaning technique) and by technology using non halogenated solvents. In addition the use of Tetrachloroethylene by dry-cleaners has been reduced by new type of fully-closed machines where the emissions are eliminated. In parallell their has been an elimination of the use of CFC. This project where alternative techniques were developed for the dry-cleaning sector has been reported. The report by June 1997 is only available in the Swedish language.

Example III: By swith to no-clean-technology in the electronic industry; to aqueous systems in precision cleaning. Example IV: By switch to non-use of CTC in the chlor-alkali industry where it was used as a solvent for NCl3

11. Subsidies and incentives

Do there exist in your country national / regional / local subsidies / incentives

Table 11	11a) to stimulate cleaner technology approaches	11b) to stimulate BAT approaches	11c) to support remediation projects?
Austria	*)		
Cyprus	For investments up to Cyprus Pounds 250000 (Euro: 432500) there is subsidy up to 30 %. For higher investments an additional 15 % is possible subject to approval by a governmental committee. This subsidy applies to the manufacturing and mining sectors only.	Same as a)	No
Czech Republic	The possibility to obtain the grants form the S tate Fund of Environment	No	No
Estonia			
Germany, Saxony	„Immissionsschutz-Förderungsprogramm Sachsen“ 30 % of the investment costs	„Immissionschutz Förderungprogramm Sachsen“ 30 % of the investment costs	
Hungary	We haven‘t used incentious yet for stimulate CP or CT	We haven‘t used BAT yet	*)
Ireland	Yes – Grants available to ancourage companies to develope with the help of Research facilities new processes/products usually 50 % the project cost is funded through Government/EU funds	Yes – same as a)	No, not a sufficiant number of contaminated sites in the country
Italy	-	-	-
Latvia	no	No	no
Lithuania	According to law on pollutant tax, if enterprise introduce same measures and it helps to reduce the pollution, it can be dismissed form paying taxes, and the taxes will be low after introducing the measuses.	The same principal	There ist State environmental protection fund and the cities environmental protection funds, which can be used for remediation projects.
Portugal	The subsidies and incentives are in discussion in Brussels	The subsidies and incentives are in discussion in Brussels	The subsidies and incentives are in discussion in Brussels
Romania	-	-	-
Slovak	-		

Table 11	11a) to stimulate cleaner technology approaches	11b) to stimulate BAT approaches	11c) to support remediation projects?
Republic			
Slovenia			
Sweden	PPP (Pollution Pays Principle) is the principle. However there has been and are different action to give financial support to the first company to try and to develop new technology to become BAT. When getting the financial support the company in question has to make deeper studies and to report the findings to the authorities and to other companies to give experience exchange and examples to be followed by others on a demonstration example.	Same as a)	One example is the development of alternative techniques within the dry –cleaner-sector where financial support was given to develop alternative techniques. 4 different kinds of techniques were developed – non halogenated solvents (hydrocarbons) and two types of such techniques were developed. – wet cleaning technique (using water) – fully closed machinery. Report by 1997 (in Swedish)
United Kingdom	See remarks at the beginning of Section	See remarks at the beginning of Section	See remarks at the beginning of Section

Comments:

Austria: *) accompanying the ordinance on plants using chlorinated hydrocarbons (BGBl.. No. 865/1994) there was the possibility to receive a subsidy of the Österreichische Kommunalkredit (duration until the end of the transition period, CHCs: 1.6.1999): prerequisite: new installation is state of the art, amount of subsidy: maximum 35 % of the environment related investment costs additionally there exists (accompanying ordinances concerning the ban on certain substances, eg. HFCHCs) the possibility to subsidise the introduction of chlorinated hydrocarbon-free techniques (duration until the end of the substance related transition periods): amount of subsidy: maximum 30 % of the environment related investment costs

Hungary: *) Hungarian remediation program for coutamined sites, this program ist part of the National Environment Program acceptet by the Parlament, Every year the government financed some clean up porjects (if there is no owner for the pollution), sometimes the polluter pays for the clean up

Slovenia: Stimulation through water taxes system. MESP/ARSPN may excempt from annually water taxes company (institution or else), which uses its funds to improve technological or any other process in a view of decreasing water pollution. This stimulation may be used only in the case of water pollution and CHC solvents may also be included in this case! Legal Background: S.01/1 and S.01/2 Environmental Protection Act and The Law Amending the Environmental Protection Act (O.J. 32/93 and 1/96) V.01/1,2,3 Decree on Water Pollution Tax (41/95, 44/95 and 8/96) Loans of Ecological Development Fund of RS Favorable loans for crediting investments on the environment protection field from Ecological Development Fund of RS Legal Background: S.03/1 Statute of the Ecological Development Fund of RS d.d. (O.J. 32/93)

S.01/1 and S.01/2 Environmental Protection Act and The Law Amending the Environmental Protection Act (O.J. 32/93 and 1/96) Remarks: MESP- Ministry of the Environment and Spatial Planning/ ARSPN- Administration of the Republic of Slovenia for the Protection of Nature.

Sweden: a**)** PPP (Pollution Pays Principle) is the principle. However there has been and are different action to give financial support to the first company to try and to develop new technology to become BAT. When getting the financial support the company in question has to make deeper studies and to report the findings to the authorities and to other companies to give experience exchange and examples to be followed by others on a demonstration example. c) example: development of alternative techniques within the dry –cleaner-sector where financial support was given to develop alternative techniques. 4 different kinds of techniques were developed – non halogenated solvents (hydrocarbons); 2 types. – wet cleaning technique (water) – fully used machinery. Report by 1997 (in Swedish)

12. Authorisation / permit / licence

12a) Can the licence contain additional mandatory conditions?

Table 12a	Concerning emission values	Concerning measures to prevent soil and groundwater contamination	Concerning monitoring	Concerning production data (e.g. temperature, pressure)	Comments
Austria	yes	yes	yes	no	
Cyprus	yes	yes	yes	yes	
Czech Republic	yes	yes	yes	Yes	Monitoring concerns the watre protection
Estonia	yes	yes	yes	yes	Other: height of emission
Germany	yes	no	yes	yes	It depends on the special case
Hungary	yes	yes	yes		
Ireland	yes	yes	yes	yes	Yes, waste records/disposal locations
Italy	yes	yes	yes	Yes	
Latvia	No	No	No	No	
Lithuania	yes	Yes (it depends on enterprise)	yes	No	Each enterprise gives documents, which can show how big pollution will be, which kind of measures will be introduced. In the permit can be written mandatory conditions according to monitoring.
Protugal	no	no	no	no	
Romania	yes	yes	yes	yes	
Slovak Republic	yes	yes	yes		
Slovenia	no	yes	yes	no	
Sweden	yes	yes	yes	yes	See comment below on other types of permit conditions
United Kingdom	yes	yes	yes	yes	

Comments:

Slovenia: For any new, changed or modified technological or other process in a potential pollution source the Operational Permit is necessary. Operational Permit provides a legal background for all technical data, certificates, approvals, attests, measures, first monitoring and else needed for sufficient environment protection.

Legal Background: Law on Building Objects (O.J. SRS 34/84, 29/86 and O.J. RS 59/96)

Sweden: Other types of conditions: - production details and production capacity – concerning process and operating details – concerning treatment measures – concerning management aspects –concerning start up of process, momentary, stoppages , definite cessation of operations and malfunctions – concerning use of less hazardous substances – concerning studies of different kinds and concerning development of new technology – concerning the geografical location of the plant etc.

United Kingdom: An Authorisation (Licence) can contain any additional mandatory condition deemed by the Regulating Authority to meet special requirements of site specific conditions. The operator can appeal to the Secretary of State against the conditions imposed, and if necessary to the Law Courts for a Judical Review of the actions taken.

12b) The licence?

Table 12b	Is limited to a certain time period	Is reviewed periodically	Can be reviewed by the authority at any time	Comments
Austria	no	no	yes	Only if there is unforeseen danger to life or health of people, a heavy molestation of the neighbourhood or danger to the (ground)water
Cyprus	yes	yes	yes	
Czech Republic	yes (usually 1 year)*	no	yes **	*)It concerns the Ozon Layer Production Act (CCl4, CH3 CCl3), **) It concerns the waste water
Estonia	1-10 years	-	yes	Issued for up to 10 years and can be reviewed by the authoity if the fegislation changes, e.g. the stricter limit values are established by the regulation.
Germany	no	no	yes (if BAT ist approached)	
Hungary	4 – 6 years			Each Regional Inspectorate controll the companies belonging to ist territory (see next point)
Ireland	no	no	yes (from 5 years after granted)	Following the I99e directives full implementations new regulations will require the licences be review frequantly
Italy	4 years (waste	yes	yes	

Table 12b	Is limited to a certain time period	Is reviewed periodically	Can be reviewed by the authority at any time	Comments
	water)			
Latvia	no	no	no	
Lithuania	yes (it depends on enterprise)	no	no	If all limit values are reached, the permit can valid 5 years, if enterprise must to intrudes same measures permit valid till the end of measures introducing. The economic situation is not stabile in Lithuania, so the permit usually valids only one year.
Portugal				The waste water discharge permits are valid of about two years. The industrial permits are vali for ever if the factory dosn‘t have modifications in the indurstrial process and any kind of claims. The waste water discharge permits are reviewed at least every four years. Also this permit is reviewed if there is modifications in the waste water treatment process and the existance of claims. The industrial permits are reviewed if there is modifications in the industrial process and the existance of claims. The existance of claims imlies the review of the pemits.
Romania	5 years	yes	yes	
Slovak Republic			yes	
Slovenia	not limited		yes	
Sweden	No	10 years or shorter	yes	The licence can be cancelled; The Environmental Code regulates the procedures.
United Kingdom	no	At least every 4 years	YesThe Authorisation can	The Authorisation can be reviewed at any time deemed necessary by the Regulating Authority. This decision can be challenged by appeal to the Secretary of State, and if necessary to the Law Courts for a Judical Review of the actions taken.

13. Monitoring

Which form of monitoring of an industrial plant is usually applied for the given parameters?

13a) Self monitoring (either by own Staff or authorized private company)

Table 13a	Technical Equipment	Waste water concentration	Air emission values	Ambient air concentration	Groundwater concentration	Receptor water concentration	Soil atmosphere concentration	Others
Austria	weekly	annual	annual				Annual	Cooling water annual
Cyprus	twice a year	monthly	continiously twice a year	continiously				
Czech Republic		The frequency is determinated by amount of waste water	Above 10 t/year CHC in emission: continiously Under 10 t/year CHC in emission: annual	In the case the saving ~ occationally				
Estonia	daily	annual	annual		annual			
Germany, Saxony	daily	monthly	continiously					
Hungary	monthly	Monthly/twice a year	x1) continiously, daily, monthly	Daily, montly	annual			
Ireland	continiously	daily	continiously		Twice a day	Twice a day	Annual	
Italy		others	annual					Other waste
Latvia			monthly			Monthly		
Lithuania		Monthly/twice a year	annual		Annual			
Portugal x)								
Romania	-	-	-	-	-	-	-	-
Slovak Republic		others	others		others			

Table 13a	Technical Equipment	Waste water concentration	Air emission values	Ambient air concentration	Groundwater concentration	Receptor water concentration	Soil atmosphere concentration	Others
Slovenia		Dependent on wastewater flow and concentrations of pollutants	Dependent on waste gases emission flow and concentrations of pollutants					Set legal background for monitoring of soil
Sweden	-	-	--	-	-	-	-	-
United Kingdom	Daily	Daily	Daily	annual	twice a year	daily	twice a year	

13b) Monitoring by the authority (either by Authorithy's own Staff or authorized private company)

Table 13b	Technical Equipment	Waste water concentration	Air emission values	Ambient air concentration	Groundwater concentration	Receptor water concentration	Soil atmosphere concentration	Soil lechate concentration
Austria	*	*	*	*	*	*	*	*
Cyprus	annual	twice a year	twice a year	continiously				
Czech Republic		3 times a year at least according to amount of waste water by Czech Environmental inspectorate						
Estonia	annual	annual	annual		Every 5 years		Every 5 years	
Germany	x1) twice a year x2) every 5 years	Twice a year	x3) continiously annual, ev. 3 years	Every 5 years	Others		Others	
Hungary	Twice a year	Twice a	Montly/twice a	Twice a year				

Table 13b	Technical Equipment	Waste water concentration	Air emission values	Ambient air concentration	Groundwater concentration	Receptor water concentration	Soil atmosphere concentration	Soil lechate concentration
		year/annual	year					
Ireland	annual	Twice a year	Twice a year	others	Others	Annual	Others	Twice a year
Italy		others	others		Twice a year	Monthly		
Lithuania		Monthly/twice a year/annual	Twice a year/annual/every 2 years					
Protugal x)								
Romania	Daily	Daily	Daily	Continiously, daily, monthly, twice a year, annual		monthly	monthly	
Slovak Republic		others	others		Others			
Sweden	-	-	-	-	-	-	--	-
United Kingdom	twice a year	annual	annual	annual	annual	monthly	annual	monthly

Comments:

Austria: inspection frequency of authority depends on the specific situation

Cyprus: The frequency of monitoring for air emission values depends on the type and size of process and the type and magnitude of emission. Ambient air concentration is monitored by the Electrical Authority of Cyprus around the two power stations. The Ministry of Labour and Social Insurance monitors ambient air concentration in the city of Nicosia.

Czech Republic: 1) The frequency is determinated by amount of waste water. 2) Above 10 t/year CHC in emission. 3) Under 10 t/year CHC in emission. 4) In the case the resening (saving) occassionally. 5) 3 times a year at least according to amount of waste water by Czech Environmental Inspectorate.

Germany: x1) if there is a license necessary. x2) with no special license. x3) if the emissions are registrated continiously and the data are transmitted „on line“ to the authority.

Hungary: The bigger industrial plants have some self monitoring system, accepted by the regional environmental authorities. x1) depend on the substance emitted.

Lithuania: Usually enterprises make measurements 4 times a year for wastewater. State monitoring depends how lage the enterprise is. It can be controlled two times per year, one time per year or one time during two years.

Portugal: The most hazardous substances aren't monitored by now, although there is a monitoring plan running under Ministry of Environment. Monitoring of air emissions: there isn't a monitoring plan for the given parameters.

Romania: ccording to the standard of the specific substance and to the potential hazardous impact on the environment

Slovenia: **Legal background:** V.02/1 Decree on the Emission of Substances and Heat in the Discharge of Wastewater from the Sources of Pollution Source, (O.J. RS No. 35/96)

V.07/1 Regulations on the Initial Measurements and Operation Monitoring of Wastewater, and on the Conditions of Its Implementation, (O.J. 35/96)

Regulations on Health Suitability of drinking Water (O.J. 46/97)

Z.02/1 Decree

Z.17/1 Regulations on the Initial Measurements and Operation Monitoring of the Emission of Substances into Atmosphere from Stationary Sources of Pollution, and on the Conditions of Its Implementation, (O.J. 70/96)on Limit Values, Alert Thresholds and Critical Imission Values for Substances Emitted into Atmosphere, (O.J. 73/94)

T.02/1 Decree on the Limit, Warning and Critical Imission Values of Toxic Substances in Soil, (O.J. 68/96)

T.03/1 Regulations on the Initial Measurements and Operation Monitoring of the Emission of Toxic Substances and Plant Nutritions into the Soil, (O.J. 55/97)

Sweden: Operator self monitoring is compulsory and stated by law – In addition the authority is entitled to access a factory or other installations to make monitoring or to comission a consultant to do so. The company must cover the costs. Mostly the main monitoring task of the authority is to examine the reliability of operator self monitoring data by different methods.

14. Legal consequences for non-compliance

14a) Which legal body pursues non-compliances?

Table 14a	Administrative body	Court of justice for criminal affairs	Court of justice for civil affairs	Others
Austria	yes			
Cyprus		yes		
Czech Republik	Local Autorities Czech Envrionmental Inspectours	no	no	no
Estonia	Environmental Inspectorate	Court (3 steps)	Court (3 steps)	
Germany, Sachsen	Regierungspräsidium, Landkreis/Kreisfreie Stadt	Amtsgericht	Amtsgericht	
Hungary	regional/governmental/env. inspectorate			
Ireland	EPA through court			
Italy		Procura della republica		
Latvia	regional environm. boards		yes	
Lithuania	Administrative body, name: Regional environmental protection department			
Portugal	Inspectorate of Environment		Court of justice of civil affairs	
Romania	yes		yes	
Slovak Republic	Administrative body, name: SIE distirct authority			
Slovenia	IRSESP and MIRS, CARS			County Courts (44) Higher Courts (4) District Courts (11) Supreme Court of the Republic of Slovenia
Sweden	County respectively Municipal environmental authority	Enforcement Service Authority		
United	Environment Agency/ Local	Magistrate/Crown Court	Crown Court	

Table 14a	Administrative body	Court of justice for criminal affairs	Court of justice for civil affiars	Others
Kingdom	Authorities			

14b) Range (lowest to highest) of penalties for non-compliance

Table 14b	Yes	No	Euro	Others
Austria			up to 2180 Euro	
Cyprus	yes		max. 3500 Euro	upto two years imprisonment, or both penalties together
Czech Republic	yes		approximately 0 – 280.000 Euro	enclosing plants
Estonia				
Germany, Sachsen	yes		50.000 Euro highest *)	
Hungary			About 1 Euro/kg	
Ireland	yes		0 – 1.000.000 Euro	
Italy	yes		5000 – 100.000 Euro	Under arrest (From 6 Month to 3 Years)
Latvia	yes		Not over 250 Euro	
Lithuania	yes			
Portugal	yes		249.999 – 2.493.989 Euro	
Romania	yes		4000 Euro	Closing of the plat interdiction of an activity (temporary, till the remediation)
Slovak Republic	yes		100 – 25.000 Euro	
Slovenia				
Sweden	-			
United Kingdom	yes		0 – 30.000 Euro	Plus up to 2 years in prison

Comments:

Austria: for eacht point of non-compliance (This could be 10 and more points)

Cyprus: Upto two years impriosonment, or both penalties together.

Germany: *) there is no lowest penalty fixed

Hungary: The rate of penalty: 200 HHF/kg organicsolvents in the effluent

Ireland: Can halt production by cearing an emission. Most usual penalty would be *1.000 Euro + costs of 6.000 EURO = 7.000 Euro

Lithuania: The penalty can be personal and can be to the enterprise. Personal penalty can be 25 – 2500 Euro

Slovenia: MINOR OFFENCE

Violator

Authorized person may fine violator for minor offence on the spot with at least 50 Euro fine.

Legal Entity (company, institution or else…) and responsible person

Legal entity may be fined for minor offences of higher importance with at least 1.000 or 2.500 Euro and responsible person of that legal entity may be fined for the same offence with at least 250 Euro.

For minor offences only the lowest limit is determined.

CRIMINAL OFFENCE

Responsible person

violators for criminal offences against Environment and Natural Resources may be imposed a fine (not limited) or prison penalty from 15 days to twelve years.

Legal background:

Penal Code of the Republic of Slovenia (O.J. 64/94, 70/94 and 23/99)

S.01/1 The Environmental Protection Act (O.J. 32/93, 1/95)

V.02/1 Decree on the Emission of Substances and Heat in the Discharge of Wastewater from the Sources of Pollution Source, (O.J. RS No. 35/96)

V.07/1 Regulations on the Initial Measurements and Operation Monitoring of Wastewater, and on the Conditions of Its Implementation, (O.J. 35/96)

Z.03/1 Decree on the Emission of Substances into Atmosphere from Stationary Sources of Pollution, (O.J. 73/94)

T.02/1 Decree on the Limit, Warning and Critical Imission Values of Toxic Substances in Soil, (O.J. 68/96)

Space for comments

IRSOP- Inspectorate of the Republic of Slovenia for the Environment and Spatial Planning, MIRS – Market Inspectorate of the Republic of Slovenia, CARS – Customs Administration of the Republic of Slovenia

Sweden: It is compulsory for the inspecting authority to report non-compliance to the Enforcement Service Authority. In addition the Environmental Code stipulates Environmental Sanction Charges to be imposed for various kinds of violations. In such cases the decision is taken by the inspecting authority.

15. Final questions

Table 15	Approximate Number of industrial plants using more than 1 ton CHC per year in your country	Approximate Number of contaminated sites of industrial plants using CHC in your country	Average duration of licensing procedures for such platns	Comments
Austria	10	20 - 30	3 –78 (with appeals) weeks	
Cyprus	6		25 – 30 weeks	
Czech Republic	50	10	4 – 8	
Estonia	-	-	8 weeks	Number of industrial plants and contaminated sites not known
Germany, Saxony	> 7 (without dry cleaning)	2400	26	
Hungary	80 - 90	10 -20	4 – 8	
Ireland	25	3	24	
Latvia	6	not identified		Licensing procedures determine draft IPPC regulations/in future
Lithuania	10		4 weeks	
Portugal	not available	not available	The IPPC Directive 96/61/EC of 24 September 1996 will be transposed in a short time and its implementation shall be change the average duration of licensing procedures.	
Romania	17 (CCl_4 users)			
Slovak Republic	-			
Slovenia	*)	**)		*)Collecting Data and Information from Industry Sector. EU legislation on this field was just adopted and IRSESP is collecting information on this field at the moment **)Duration of licensing procedures for plants using

Table 15	Approximate Number of industrial plants using more than 1 ton CHC per year in your country	Approximate Number of contaminated sites of industrial plants using CHC in your country	Average duration of licensing procedures for such platns	Comments
				CHC solvents varies case by case, due to complexity and environment impact of investment.
Sweden	-	-	-	-
United Kingdom	13,000	n.a.	16 weeks	

ANNEX E

EU-Regulations

Contents

EU-REGULATIONS

Compiled by:
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1. Directive 1999/13/EC: On the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain industrial activities and installations:

1.1. New Installations

1.1.1. . All new installations should comply with emission limit values in waste gases, fugitive emission values and total emission values or with the requirements of the reduction scheme.

1.1.2. All new installations should be registered or licensed.

1.2. Existing installations

1.2.1. All existing installations must be adjusted to the emission limit values by 31. October 2007 at the latest

1.2.2. All existing installations must be registered or authorised by 31.October 2007 at the latest.

1.2.3. Installations using the reduction scheme (Annex II B), the legal body must be informed by 31. October 2005 at the latest.

1.3. Demands

1.3.1. Dangerous substances and preparations classified as carcinogens, mutagen and toxic to reproduction under directive 67/548/EEC with the risk phrases R 45, 46, 49, 60 und 61 shall be replaced as far as possible.
Limit value as far as possible: 2mg VOC/Nm3, where the mass flow of the sum of the compounds causing the labelling is 10g/h or more.

1.3.2. Volatile halogenated organic substances and preparations with the special risk advice R40 (harmful).
Limit value as far as possible: 20mg/ Nm^3, where the mass flow is 100g/h or more

1.3.3. Existing installations which comply with the following emission limit value
- 50mg C/Nm^3 in the case of incineration
- 150mg C/Nm^3 in the case of any other abatement equipment

shall be exempt from the waste gases emission limit values for a period of 12 years after April 2001.

Annex II A: thresholds and limit values

Industrial sector (threshold for the solvent consumption in tonnes/year)	**Threshold** (solvent consumption in tonnes/year)	**Emission limit for waste gas** mg C/Nm^3	**Fugitive emission limit percentage of solvent input** new* exist.*	**Total emission limit** new* exist.*
Surface cleaning (> 1)	1 – 5	20	15	
Other surface Cleaning (> 2)	2-10	75	20	

Industrial sector (threshold for the solvent consumption in tonnes/year)	**Threshold** (solvent consumption in tonnes/year)	**Emission limit for waste gas** mg C/Nm³	**Fugitive emission limit percentage of solvent input** new* exist.*	**Total emission limit** new* exist.*
vegetable oil and animal fat extraction (> 10)				animal fat: 1,5kg/t Rizinus: 3,0kg/t rapeseed: 1,0kg/t sun flower seed: 1,0kg/t soybean: 0,8 esp.. 1,2kg/t other seeds and other vegetable material: 3 esp. 1,5 esp. 4kg/t
coil coating (> 5)				10g/kg 5g/kg
manufacturing of coating preparations, adhesives and solvents (> 10)	100-1000 > 1000	150 150	5 3	5% for applied solvents 3% for applied solvents
manufacturing of pharmaceutical products (> 50)		20	5 15	5% 15% for applied solvents
Rubber conversion (> 15)		20	25	25% for applied solvents
vehicle coating (< 15)	> 0,5	50	25	
printing 1) headset- (> 15) 2) Illustrations (> 25) 3) other printing measures (> 30)	 15-25 > 25 15-25 > 25 > 30	100 20 75 100 100 100	30 30 10 15 25 20 20	
adhesive coating (> 5)	5-15 > 15	50 50	25 20	
Dry cleaning				20g/kg

<u>Special provisions</u> in Annex II A must be observed.

* new and existing installations

<u>Annex II B: reduction scheme</u>

The same reduction can be reached by substitution, as it would be made by applying the emission limit values.

Period of time		**Total emission limit**
new installations	**existing installations**	
until 31.10.2001	until 31.10.2005	target emission x 1,5
until 31.10.2004	until 31.10.2007	target emission

2. <u>Directive 3093/94/EEC</u>: relating to substances, which reduce ozone layer:

A) production of tetrachloromethane is prohibited since 1.1.1995

B) production of 1,1,1-trichloroethane is prohibited since 1.1.1996

3. Directive 76/769/EEC: Annex I, concerning the limitation of dangerous substances (chlorinated hydrocarbons) relating to the use and placing on the market:

Limitation: a) preparations not intended for the general public

b) the use is prohibited in industrial plants, where emissions cant be excluded (surface cleaning, dry cleaning, etc.)

Substances:
- chloroform
- tetrachloromethane
- 1,1,2,2-tetrachloroetane
- 1,1,1,2-tetrachloroethane
- pentachloroethane
- 1,1-dichloroethylene
- 1,1,1-trichloroethane

4. Directive 67/548/EEC: concerning the classification, labelling and packaging of dangerous substances and preparations:

5. Directive 76/464/EEC: on pollution caused by certain dangerous substances discharged into aquatic environment on the community:

1. The Council Directive 76/464/EEC applies to inland surface water, territorial waters, internal coastal waters to eliminate pollution of these waters. Two lists of dangerous substances to be monitored are established:
   - pollution caused by discharges of substances on list I must be ended;
   - pollution caused by products on list II must be reduced.
2. Quality objectives and emission standards are laid down for the substances on list I, based on the best available technology. These are compulsory unless the Member States prove that the quality objectives are being met and continuously maintained. All discharges require prior authorization by the competent authority in the Member State concerned. The authorization is granted for a limited period and lays down the emission standards. It is up to the Member States to ensure compliance with the emission standards.
3. For the substances on list II, the Member States adopt and implement programmes to preserve and improve water quality. All discharges are subject to prior authorization by the competent authority in the Member State concerned, once again laying down the emission standards.
4. The Member States systematically monitor water quality and may take more stringent measures than provided for by Directive 76/464/EEC.
5. Specific provisions on groundwater are included.
6. A procedure is laid down for revising and adding to the lists or transferring specific substances from **list II to list I**.

List I of families and groups of substances

Organohalogen compounds and substances, which may form such compounds in the aquatic environment.

List II of families and groups of substances:

This list contains also substances belonging to the families and groups of substances in list I for which the limit values referred to in Article 6 of the Directive have not been determined and certain other substances not important for this workshop.

Following substances of list I are limited:

	Substance	Directive	Annex
1.	Carbon tetrachloride = Tetrachloromethane	86/280	I. Specific provisions
2.	DDT	86/280	II. Specific provisions
3.	Pentachlorophenol (PCP)	86/280	III. Specific provisions
4.	Aldrin	88/347	IV. Specific provisions
	Dieldrin	88/347	IV. Specific provisions
	Endrin	88/347	
	Isodrin	88/347	IV. Specific provisions
5.	Hexachlorobenzene (HCB)	88/347	V. Specific provisions
6.	Hexachlorobutadien (HCBD)	88/347	VI. Specific provisions
7.	Chloroform (1,1,1-Trichloromethane)	88/347	VII. Specific provisions
8.	1,2-Dichlorethane (EDC)	90/415	VIII. Specific provisions
9.	Trichloroethene (TRI)	90/415	IX. Specific provisions
10.	Tetrachloroethene (PER)	90/415	X. Specific provisions
11.	Trichlorobenzene (TCB)	90/415	XI. Specific provisions
12.	Hexachlorocyclohexane (HCH)	84/891	

6. Directive (86/280/EEC): on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC:

This Directive is one of the daughter directives of the dangerous substances directive 76/464/EEC, and gives limits of 15 dangerous substances. This directive gives limit values for emission standards, quality objectives and reference methods of measurement. All industrial plants must comply the emission limit values.

I. Specific provisions relating to carbon tetrachloride:

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit values expressed as		To be complied since
		Weight	concentration	
Carbon tetrachloride production by per-chlorination	Monthly	a) Process involving washing: 40g CCl_4 per tonne of total production capacity of CCl_4 and perchlorethylene	1,5 mg/l	1.1.1988
		b) Process not involving washing: 2,5 g/tonne	1,5 mg/l	1.1.1988
	Daily	a) Process involving washing: 80 g/tonne	3 mg/l	1.1.1988
		b) Process not involving washing: 5 g/tonne	3 mg/l	1.1.1988
Production of chloro-methanes by methan-chlorination (including high-pressure electrolytic chlorine generation) and from methanol	Monthly	10 g CCl_4 per tonne of total production capacity of chloromethanes	1,5 mg/l	1.1.1988
	Daily	20 g per tonne	3 mg/l	1.1.1988
Production of chlorofluoro-carbons	Monthly	-	-	-
	Daily	-	-	-

A simplified monitoring procedure may be introduced if annual discharges do not exceed 30 kg a year.

Quality objectives:

Environment	Quality objective	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary - Territorial waters	12 µg/l	1.1.1988

II. Specific provisions relating to DDT:

STANDSTILL: The concentration of DDT in the aquatic environment, sediments and/or molluscs and/or shellfish and/or fish must not increase significantly with time.

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		g/tonne of substances produced, handled or used	mg/l of water discharged	
Production of DDT including formulation of DDT on the same site	Monthly	4	0,2	1.1.1991
	Daily	8	0,4	1.1.1991

A simplified monitoring procedure may be introduced if annual discharges do not exceed 1 kg a year.

Quality objectives:

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	10 µg/l for the isomer para-para-DDT 25 µg/l for total DDT	1.1.1988

III. Specific provisions relating to pentachlorophenol (PCP):

STANDSTILL: The concentration of PCP in sediments and/or molluscs and/or shellfish and/or fish must not increase significantly with time.

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		g/tonne production/ utilization capacity	mg/l of water discharged	
Production of sodium pentachlorophenate by hydrolysis of hexachloro-benzene	Monthly	25	1	1.1.1988
	Daily	50	2	1.1.1988

A simplified monitoring procedure may be introduced if annual discharges do not exceed 3 kg a year.

Quality objectives:

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	2 µg/l	1.1.1988

7. Directive 88/347/EEC: amending Annex II to directive 86/280/EEC on limit values and objectives for discharges included in List I of the Annex to directive 76/464/EEC:

IV. Specific provisions relating to aldrin, dieldrin, endrin, isodrin:

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight	Concentration in effluent µg/l of water discharged	
Production of aldrin and/or dieldrin and/or endrin including formulation of these substances on the same site	Monthly	3 g per tonne of total production capacity (g/t)	2	1.1.1989
	Daily	15 g per tonne of total production capacity (g/t)	10	1.1.1989

Quality objectives:

Environment	Substance	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	Aldrin Dieldrin Endrin Isodrin	10 ng/l 10 ng/l 5 ng/l 5 ng/l	1.1.1994

STANDSTILL: The concentration(s) of aldrin and/or dieldrin and/or endrin and/or isodrin in sediments and/or molluscs and/or shellfish and/or fish must not increase significantly with time.

V. Specific provisions relating to hexachlorobenzene (HCB):

Limit values for emission standards:

STANDSTILL: There must be no significant direct or indirect increase over time in pollution arising from discharges of HCB and affecting concentrations in sediments and/or molluscs and/or shellfish and/or fish.

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight	Concentration	
HCB-production and processing	Monthly	10 g HCB/tonne of HCB production capacity	1 mg/l HCB	1.1.1990
	Daily	20 g HCB/tonne of HCB production capacity	2 mg/l HCB	1.1.1990
Production of perchloro-ethylene (PER) and carbon tetrachloride (CCl_4) by perchlorination	Monthly	1,5 g HCB/tonne of PER + CCl_4 total production capacity	1,5 mg/l HCB	1.1.1990
	Daily	3 g HCB/tonne of PER + CCl_4 total production capacity	3 mg/l HCB	1.1.1990
Production of trichloro-ethylene and/or perchloro-ethylene by any other process	Monthly	-	-	-
	Daily	-	-	-

A simplified monitoring procedure may be introduced if annual discharges do not exceed 1 kg a year.

Quality objectives:

STANDSTILL: The concentration of HCB in sediments and/or molluscs and/or shellfish and/or fish must not increase significantly with time.

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	0,03 µg/l	1.1.1988

VI. Specific provisions relating to hexachlorobutadiene (HCBD):

Limit values for emission standards:

STANDSTILL: There must be no significant direct or indirect increase over time in pollution arising from discharges of HCB and affecting concentrations in sediments and/or molluscs and/or shellfish and/or fish.

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight	Concentration	
Production of perchloro-ethylene (PER) and carbon tetrachloride (CCl_4) by perchlorination	Monthly	1,5 g HCBD/tonne of total production capacity of PER + CCl_4	1,5 mg/l HCBD	1.1.1990
	Daily	3 g HCBD/tonne of total production capacity PER + CCl_4	3 mg/l HCBD	1.1.1990
Production of trichloro-ethylene and/ or perchloro-ethylene by any other process	Monthly	-	-	-
	Daily	-	-	-

A simplified monitoring procedure may be introduced if annual discharges do not exceed 1 kg a year.

Quality objectives:

STANDSTILL: The concentration of HCBD in sediments and/or molluscs and/or shellfish and/or fish must not increase significantly with time.

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	0,1 µg/l	1.1.1990

VII. Specific provisions relating to Chloroform ($CHCl_3$):

Limit values for emission standards:

Type of industrial plant	Limit values (monthly averages) expressed as		To be complied since
	Weight	Concentration	
Production of chloro-methanes from methanol or from a combination of methanol and methane	10 g $CHCl_3$/tonne of total production capacity of chloromethanes	1 mg/l	1.1.1990
Production of chloro-methanes by chlorination of methane	7,5 g CHCl3/tonne of total production capacity of chloromethanes	1 mg/l	1.1.1990
Production of chlorofluoro-carbon (CFC)	-	-	-

A simplified monitoring procedure may be introduced if annual discharges do not exceed 30 kg a year.

Quality objectives:

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	12 µg/l	1.1.1988

8. Directive 90/415/EEC: amending annex II to directive 86/280/EEC on limit values and quality objectives for discharges of certain substances included in list I of the annex to directive 76/464/EEC:

VIII. Specific provisions relating to 1,2-Dichlorethan (EDC):

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight (g/t)	Concentration (mg/l)	
a) Production only of 1,2-dichloroethane (without processing or use on the same site)	Monthly	2,5	1,25	1.1.1995
	Daily	5	2,5	1.1.1995
b) Production of 1,2-dichloroethane and processing or use at the same site except for the use defined in (e) below	Monthly	5	2,5	1.1.1995
	Daily	10	5	1.1.1995
c) Processing of 1,2-dichloroethane into sub-stances other than vinyl chloride	Monthly	2,5	1	1.1.1993
	Daily	5	2	1.1.1993
d) Use of EDC for de-greasing metals (away from an industrial site covered by (b)	Monthly	-	0,1	1.1.1993
	Daily	-	0,2	1.1.1993
e) Use of EDC in the pro-duction of ion exchanges	Monthly	-	-	-
	Daily	-	-	-

A simplified monitoring procedure may be introduced if annual discharges do not exceed 30 kg a year.

Quality objectives:

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	10 µg/l	1.1.1993

IX. Specific provisions relating to trichloroethylene (TRI):

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight (g/t)	Concentration (mg/l)	
Trichloroethylene (TRI) and perchloroethylene (PER) production	Monthly	2,5	0,5	1.1.1995
	Daily	5	1	1.1.1995
Use of TRI for degreasing metals	Monthly	-	0,1	1.1.1993
	Daily	-	0,2	1.1.1993

A simplified monitoring procedure may be introduced if annual discharges do not exceed 30 kg a year.

Quality objectives:

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	10 µg/l	1.1.1993

X. Specific provisions relating to perchloroethylene (PER):

Limit values for emission standards:

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight (g/t)	Concentration (mg/l)	
Trichloroethylene (TRI) and perchloroethylene (PER) production (TRI-PER processes)	Monthly	2,5	0,5	1.1.1995
	Daily	5	1	1.1.1995
Carbon tetrachloride and perchloroethylene production (TETRA-PER processes)	Monthly	2,5	1,25	1.1.1995
	Daily	5	2,5	1.1.1995
Use of PER for degreasing metals	Monthly	-	0,1	1.1.1993
	Daily	-	0,2	1.1.1993
Chlorofluorocarbon production	Monthly	-	-	-
	Daily	-	-	-

A simplified monitoring procedure may be introduced if annual discharges do not exceed 30 kg a year.

Quality objectives:

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	10 µg/l	1.1.1993

XI. Specific provisions relating to trichlorobenzene (TCB):

Limit values for emission standards:

STANDSTILL: There must be no significant direct or indirect increase over time in pollution arising from discharges of TCB and affecting concentrations in sediments and/or molluscs and/or shellfish and/or fish.

Type of industrial plant	Type of average value	Limit value expressed as		To be complied since
		Weight (g/t)	Concentration (mg/l)	
Production of TCB via dehydrochlorination of HCH and/or processing TCB	Monthly	10	1	1.1.1995
	Daily	20	2	1.1.1995
Production and/or processing of chloro-benzenes via chlorination of benzene	Monthly	0,5	0,05	1.1.1995
	Daily	1	0,1	1.1.1995

Quality objectives:

STANDSTILL: There must be no significant increase over time in the concentration of TCB in sediments and/or molluscs and/or shellfish and/or fish.

Environment	Quality objectives	To be complied since
- Inland surface waters - Estuary waters - Internal coastal waters other than estuary waters - Territorial sea waters	0,4 µg/l	1.1.1993

9. Directive 84/891/EEC: Council directive on limit values and quality for discharges of hexachlorocyclohexane:

This is another daughter directive of the dangerous substances directive 76/464/EEC. All discharges of HCH in water without groundwater have to be permitted, and shall be reviewed at least every four years. Every three years the member States shall give a report to the Commission concerning the implementation of the directive and the monitoring system. The Commission shall publish in the time of nine month the reports of the member states to a complete report in the case of the implementation of the directive.

Limit values:

Industrial sector	Unit of measurement	Limit values
Plant for the production of HCH	g/t of HCH produced	2
	mg/l of HCH discharged	2
Plant for the extraction of lindane	g/t of HCH treated	4
	mg/l of HCH discharged	2
Plant where the production of HCH and extraction of lindane is carried out	g/t of HCH produced	5
	mg/l of HCH discharged	2

The limit values by weight given in the above table, expressed in terms of the quantity of HCH discharged in relation to the quantity of HCH produced or treated, must be complied with in all cases.

Quality objectives:

The total HCH concentration of HCH in inland surface waters must not exceed 100 ng/l.

The total concentration of HCH in estuary waters and territorial sea waters must not exceed 20 ng/l.

The total concentration of HCH in sediments and/or molluscs and/or shellfish and/or fish must not increase significantly with time.

Where several quality objectives are applied to waters in an area, the quality of the waters must be sufficient to comply with each of those objectives.

10. Directive 80/68/EEC: on the protection of groundwater against pollution caused by certain dangerous substances:

1. The purpose of this Directive is to prevent the discharge of certain toxic, persistent and bioaccumable substances into groundwater.
2. The following are excluded:
   - discharges of domestic effluents from isolated dwellings;
   - discharges containing substances listed in Directive 80/68/EEC in very small quantities and concentrations
   - discharges of matter containing radioactive substances.
3. There are two lists of dangerous substances drawn up for the protection of groundwater:
   - direct discharge of substances in list I is prohibited;
   - discharge of substances in list II must be limited.
4. All indirect discharges of substances in list I and list II all direct or indirect discharges of substances in list II are subject to prior authorization. Such authorization:
   - is granted after an investigation into the receiving environment;
   - is granted for a limited period and subject to regular review;
   - lays down the conditions that have to be met for discharges. If they have not been or cannot be met, the authorization is withdrawn or refused.

5. Monitoring of compliance with these conditions and of the effects of discharges on groundwater is the responsibility of the competent authorities of the Member States.
6. Exceptions under certain conditions to the ban on discharges of substances in list I.
7. Inventory of authorizations:
   - of discharges of substances in list I;
   - of direct discharges of those in list II;
   - of artificial recharges for the purpose of groundwater management.
8. Procedure for communicating information between Member States in the event of discharges into transfrontier groundwater.
9. Member States may take more stringent measures than those provided for under these Directives.
10. Every three years, reports by the Member States on the implementation of Directive 80/68/EEC and other relevant Directives, drawn up on the basis of a questionnaire or outline drafted by the Commission in accordance with the procedure laid down in Directive 91/690/EEC. The Commission is responsible for publishing a report on the basis of this information.

For this directive no emission limit values are available.

In List I are following substances listed:

1. Organohalogen compounds and substances which may form such compounds in the aquatic environment

11. Amended proposal for a European Parliament and Council Directive establishing a framework for Community action in the field of water policy (COM (97) 49 final) – (Water framework directive):

A lot of different existing directives should be included in the new water framework directive. The dangerous substances directive 76/464/EEC and the groundwater directive should be included in the new directive.

The following substances were finally selected and recommended for inclusion in the first priority list (Annex X):

Priority organic micropollutants (monitoring-based list):

1. PAHs
2. Pentachlorophenol
3. Heptachlor
4. Chlorpyifos
5. Hexachlorobenzene
6. Monochloronitrobenzenes
7. Tichlorobenzenes
8. Chlorfenviphos
9. Diuron
10. Trifluralin
11. Trichloromethane
12. Dichloromethane
13. 1,2-Dichloroethane
14. Isoproturon
15. Endosulfan
16. Alachlor
17. Hexachlorobutadiene
18. HCHs
19. Atrazine
20. Simazine
21. Chloroalkanes, C 10-13
22. Benzene
23. Nitrobenzene
24. Di(2-ethylhexyl)phthalate (DEHP)
25. Octylphenols-Nonylphenols

12. <u>Directive 96/61/EC:</u> concerning integrated pollution prevention and control (IPPC):

In the 5th Environmental Action Programme the integrated pollution control has an important part of the move towards sustainable balance between human activity and socio-economic development and the resources and regenerative capacity of nature.

The directives 84/360/EEC (combating of air pollution from industrial plants) and 76/464/EEC (dangerous substances) are general frameworks to any operation or substantial modification of industrial installations, which may cause air and/or water pollution.

The objectives of an integrated approach to pollution control is to prevent emissions into air, water or soil wherever this is practicable, taking into account waste management, and, where it is not, to minimise them in order to achieve a high level of protection for the environment as a whole.

The competent authority or authorities will grant or amend a permit only when integrated environmental protection measures for air, water and land have been laid down. Emission limit values, parameters or equivalent technical measures should be based on the best available techniques (BAT).

Existing industrial plants have to operate till **4.10.2004** in accordance with the requirements of this directive. For new installations the regulation is in force since 4.10.1996 and they need permits in accordance with this directive and shall not be operated without integrated environmental protection measures.

Following relevant industrial activities are listed in **Annex I**:

2.6.) Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m^3.

4.1.) Chemical installations for the production of basic organic chemicals, such as:

- (a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic)
- (b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins
- (c) sulphurous hydrocarbons
- (d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates
- (e) phosphorus-containing hydrocarbons
- (f) halogenic hydrocarbons
- (g) organometallic compounds
- (h) basic plastic materials (polymers synthetic fibres and cellulose-based fibres)
- (i) synthetic rubbers
- (j) dyes and pigments
- (k) surface-active agents and surfactants

4.4.) Chemical installations for the production of basic plant health products and of biocides

4.5.) Installations using a chemical or biological process for the production of basic pharmaceutical products

6.7.) Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year.

Annex II lists all directives referred in article 18 and 20.

An indicative list of main polluting substances to be taken into account if they are relevant for fixing emission limit values for air and/or water is included in **Annex III**:

Air:
- 4) Volatile organic compounds
- 8) Chlorine and its compounds
- 9) Fluorine and ist compounds
- 12) Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air
- 13) Polychlorinated dibenzodioxins and polychlorinated dibenzofurans

Water:
- 1) Organohalogen compounds and substances which may form such compounds in the aquatic environment.
- 4) Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction in or via the aquatic environment
- 5) Persistent hydrocarbons and persistent and bioaccumulable organic toxic substances
- 9) Biocides and plant health products

Annex IV gives principles of precaution and prevention when determining best available techniques.

AUSTRIAN NATIONAL LAWS

1. Ordinance 865/1994: on the limitation of emissions of chlorinated organic solvents due to the use of organic solvents in certain industrial installations:

2. Ordinance 872/1995: on the prohibition and limitation of organic solvents:

3. Law 53/1996: on the protection of people and environment relating to the use of dangerous substances (Chemical Law):

3.1. Directive 776/1992 on the prohibition of 1,1,1-trichloroethane and tetrachlorometane.

3.2. Directive 69/1990 on the classification, labelling and packaging of dangerous substances and preparations.

Some examples for classification and labelling of dangerous, chlorinated substances:

Substances	**classification**	**labelling** **R = special risk phrases** **S = safety advices**	**Index-** **EWG- number** **CAS-**
dichloromethane	harmful Xn	R 40 S (2)-23-24/25-36/37	6002-004-003 200-838-9 75-09-2
1,1,1-trichloroethane	harmful Xn, environmentally dangerous N	R20, 59 S (2)-24/25-59-61	602-013-00-2 200-756-3 71-55-6
trichloroethylene	harmful Xn, cancerogen cat. 3	R 40 S (2)-23-36/37	602-027-00-9 201-167-4 79-01-6
tetrachloroethylene	harmful Xn, cancerogen cat. 3	R 40 S (2) 23-36/37	602-028-00-4 204-825-9 127-18-4
tetrachloromethane	toxic T, environmentally dangerous N	R 23/24/25-40-48/23-59 S (1/2)) 23-36/37-45-59-61	602-008-00-5 200-262-8 56-23-5

ANNEX F

Curricula Vitae (CVs)

Contents

BOLZER, Wolfgang; Austria

Profession: civil servant (city of Vienna)
Date of Birth: June 28, 1947
Nationality: Austria
Civil Status:

Education:

1971: Dipl.-Ing. der Universität für Bodenkultur in Wien (Lebensmittel- und Gärungstechnologie)
(University for agricultural sciences/Vienna - food and fermentation technology)

1983: Dr. nat.techn., Universität für Bodenkultur in Wien (thesis: organohalides in Austrian drinking waters; -- special focus on THM in drinking water and chlorinated solvents in ground waters).

Professional Experience Record:

manager of the division for environmental chemistry of the institute for environmental medicine of the health department of the City of Vienna,

deputy manager of the institute,

field of work: management of two labs for the chemical analysis of drinking-, ground and swimming-pool waters (routine and gaschromatographic), expert in the examination of drinking-, ground and swimming-pool waters

Language Skills:

Language	Speaking	Reading	Writing
German	native language	native language	native language
English	good	good	good
French	poor	poor	poor

CARNIEL, Alberto; Italy

Profession: chemist
Date of Birth: October 9, 1945
Nationality: italian
Civil Status: married

Education:

1969: industrial chemistry degree (padova university)
1979: Specialization in Food Science (padova university)
1984: Specialization in Hygiene (ancona university)

Professional Experience Record:

1971÷1978: chemist in public health laboratory with charge of water analysis
1978÷1987: chemist in public health laboratory with charge of water and food analysis
1978÷1999: chemist in public health laboratory with charge of the whole laboratory
from 1999: director of provincial department of the friuli venezia giulia environment agency
author of 60 papers in environmental and sanitary field

Language Skills:

Language	Speaking	Reading	Writing
Italian	mother tongue		
Spanish	good	good	good
English	poor	good	poor
German	fairly good	poor	poor

DUSSING, Guenter; Austria

Profession: chemist
Date of Birth: March 6, 1961
Nationality: Austria
Civil Status: married

Education:

grammar school in Salzburg
university in Graz

Professional Experience Record:

expert for chemistry and environmental technology

Dealing with the CHC-problem since more than 10 years.

Participation in different national technical working groups (e.g. Technical standards of CHC in installations; CHC – soil and groundwater remediation) and IMPEL working group „Minimum Criteria for Inspections".

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good	good	good

EBERHARTINGER, Susanna; Austria

Profession: chemist, civil servant
Date of Birth: August 8, 1965
Nationality: Austrian
Civil Status: single

Education:

1990: Graduated, M.Sc. (Technical Chemistry - Bio- and Food Chemistry)
2000: Post Graduate Diploma Course Applied Economics (≅ MBA)

Professional Experience Record:

1990 - 1991: General Social Insurance Company: Technical expert (occupational safety and health matters)

since 1994: Federal Ministry of Environment: Technical expert (pollution prevention and control of installations; environmental impact assessment; risk assessment of chemical substances)

Language Skills:

Language	**Speaking**	**Reading**	**Writing**
German	mother tongue		
English	very good	very good	very good
French	basic knowledge	basic knowledge	basic knowledge
Italian	basic knowledge	basic knowledge	basic knowledge

HAFNER, Wolfgang; Austria

Profession: environmental chemist
Date of Birth: September 9, 1961
Nationality: Austrian
Civil Status: unmarried, 2 children

Education:

1979-1985: study at the Karl-Franzens-University Graz ,
- Main subject: Biology,
- minor subject: Chemistry

1988-1993: Post graduate study: Technical Environmental Protection at the University for Engineering Graz

Professional Experience Record:

1986 - 1992: Employee of the Municipal Authority of Klagenfurt, Environmental Department as chemical expert

Since 1992: Employee of the Provincial Government of Carinthia, Environmental Department as chemical expert

Since 1999: Field manager for co-ordination of environmental EU-projects

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good	good	good

MIKLAUTSCH, Karin; Austria

Profession: Civil Servant Province of Carinthia
Date of Birth: March 11, 1963
Nationality: Austria
Civil Status: Married

Education:

1982-1988: University of Innsbruck; Degree of law

Professional Experience Record:

1988: student trainee at court in Villach and Klagenfurt:
- 2 month each trainee job at the
- Civil Court district level at Villach
- Penal Court district level at Villach
- Family Court district level at Villach
- Penal Court provincial level at Klagenfurt
- Civil Court provincial level at Klagenfurt

1988-1991: Candidate for a lawyer:
Advocate without any specifications. That means work at all courts on district and provincial level within Carinthia.

since 1991: Head of sector „Water“ and responsible for „EU Environmental Law“ at Province of Carinthia, Department 8W- Wasser-, Abfall-, Energie- und Naturschutzrecht:
- Head of Sector „Water“
  Provincial authority for drinking water supplying plants, sewage systems, sewage plants, groundwater protection, etc. and appeal procedures and decisions.
- Field of „EU Environmental Law“
  Gather all the information concerning EU environmental law, preparation of a Carinthian position concerning different items on EU environmental law, different working groups on different items, contact person of Carinthia within the Austrian „EU water network“, organisation of international workshops, member of IMPEL network, organisation of international conferences on environmental issues, etc.

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	very good	good	good
French	basic knowledge	basic knowledge	basic knowledge

MUCHITSCH, Wilhelm; Austria

Profession:	Environmental Expert for Technical Matters of the Industrial Code at the Austrian Federal Ministry for Economics and Labour
Date of Birth:	May 20, 1949
Nationality:	Austrian
Civil Status:	Married, One Daughter

Education:

1978:	Academ. Degree „Dipl.-Ing.“ of the Technical University of Vienna (End of Study „Technical Chemistry“)
1978–1986	Civil Servant of the City of Vienna
1986 -	Civil Servant of the Austrian Government

Professional Experience Record:

Leading Technical Expert for the following Austrian Regulations:

- CHC-Plant-Regulation (BGBl. Nr. 27/1990)
- Limitation of Emissions to the Air for Plaster-producing Plants (BGBl. Nr. 717/1993)
- CHC-Plant-Regulation (BGBl. Nr. 865/1994)
- Commercial Use of Sun-benches with U.V.-A – lamps (BGBl. Nr. 147/1995)
- Storage of Pressure-gas Cans in shops and plants (BGBl. Nr. 666/1995)
- Limitation of Solvent-emissions by the Use of Varnishes and Coatings in plants (BGBl. Nr. 873/1995)

Member of the Austrian Standards Institute (Air cleaning; Drycleaning, Solvent Vapours, Degreasing, Coating and Varnishing)

Member (Austrian Expert) of the Council Working Group for the Council Directive 98/13/EC on the Limitation of the Emissions of Volatile Organic Compounds due to the Use of Organic Solvents in Certain Activities and Installations (VOC-Directive)

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	Medium (School)	Medium (School)	Medium (School)

MUELLER, Dietmar; Austria

Profession:	Environmental Engineer
Date of Birth:	August 30, 1963
Nationality:	Austria
Civil Status:	happy

Education:

MSc in Land and Water Management and Engineering at the University of Agricultural Sciences, Vienna (AT)

Professional Experience Record:

since 1989: with the contaminated sites department, expert in risk assessment and management of contaminated sites, co-ordinator of various national and international working groups; i.e. head of the working group "Risk Assessment" of the Austrian National Standard Organisation (ÖNORM)

Co-ordinator of the national expert working group "Investigation, Assessment and Remediation of HC and VHC Contaminated Soils, member of the working group "Groundwater" of the EU concerted action CLARINET.

Author of various publications on risk assessment.

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	very good	very good	very good

NEMANIČ, Matjaž; Slovenia

Profession: Technical advisor
Date of Birth: January 8, 1970
Nationality:
Civil Status:

Education:

1997: University of Ljubljana, Ljubljana, Slovenia
Faculty of Chemistry and Chemical Technology
B.Sc. in Chemical Engineering

Professional Experience Record:

1995-1996 University of Ljubljana, Ljubljana, Slovenia; Faculty of Chemistry and Chemical Technology, Department of Chemical Engineering, Student Research Assistant

1996-1997 National Institute of Chemistry, Ljubljana

1998-1999 *Project Researcher*

1999 Ministry of Environment and Spatial Planning *Nature Protection Authority, Ljubljana, Slovenia*

Technical advisor - Dangerous Emission into Water

- Transposition and implementation of EU Environmental Legislation
- Technical supervision of reports from operational monitoring of water cleaning plants

Language Skills:

Language	Speaking	Reading	Writing
Slovenian	mother tongue		
English	Very good	Very good	Very good
Serbian	Very good	Very good	Very good
Croatian	Very good	Very good	Very good
German	Basic	Basic	Basic

O´CONNOR, Marie; Ireland

Profession: Inspector Licensing & Control Division Environmental Protection Agency Ireland

Date of Birth: September 3, 1964

Nationality: Irish

Civil Status:

Education:

BSc Industrial Chemistry

MSc. Chemistry (Heterogeneous Catalysis)

Professional Experience Record:

Three years Research and Development work in Ireland and France.

Three years in Development /Production areas of Organic Chemicals Manufacturing Plants in UK and Ireland.

Five years as Inspector with the Licencing and Control Division dealing with a variety of sectors including pharmaceutical industry, bulk organic manufacturers and surface coating sector.

Language Skills:

Language	Speaking	Reading	Writing
English	mother tongue		
French	fair	good	fair

PARZEFALL, Wolfram; Austria

Profession: a.o.Univ. Prof. for Toxicology
Date of Birth: April 4, 1945
Nationality: Austria
Civil Status: married

Education:

Food chemistry (exam in Marburg, Germany)

Pharmaceutical Chemistry (Thesis in analytical pharmacy, 1975, Marburg, Germany)

Human Biology, advanced studies, Marburg, Germany

Toxicology: Advanced courses of the German Society for Pharmacology and Toxicology

Training in Cell Biology (McArdle Laboratory for Cancer Research, Madison, WI, 1980)

Venia legendi in Toxicology, Medical Faculty, University Vienna, Oct. 1992

Professional Experience Record:

Scientist (assistant) at the Institute for Pharmacy and Food Chemistry, Philipps University, Marburg

Scientist (assistant) at the Institute for Toxicology and Pharmacology, Philipps University, Marburg.

Scientist (assistant) at the Institute of Cancer Research, University of Vienna

Active areas of research:
Effects and mechanisms of tumor promoters on organ growth and enzyme induction in the liver.
Toxicological testing of chemicals for cytotoxic and carcinogenic potential.

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good	good	good

RABITSCH, Michael; Austria

Profession:	Dipl.-Ing
Date of Birth:	July 13, 1965
Nationality:	Austria
Civil Status:	married

Education:

MSc in Land and Water Management and Engineering at the University of Agriculural Sciencies in Vienna (AT)

Professional Experience Record:

1991:	Civil engineering office in Vienna, planning of landfills
1992:	Federal environmental agency, Vienna, department of contaminated sites, expert for risk assessment
Since July 1992:	Province of carinthia, environmental department, expert for waste management and contaminated sites

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good	good	good

SCHIESS, Norbert; Germany

Profession: civil servant (chemist)
Date of Birth: November 3, 1952
Nationality: Germany
Civil Status: married, three children (15, 12, 9)

Education:

1982: University of Stuttgart, chemical engineering
1986: Dr. rer. Nat

Professional Experience Record:

1986 – 1991: Administration Baden-Württemberg
Since 1991: Ministry of Environment and Agriculture, Saxony

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good (school)	good (school)	good (school)

SCHINDLER, Ilse; Austria

Profession: Environmental Technologies Expert, BAT/IPPC Co-ordinator at the Austrian Federal Environment Agency

Date of Birth: October 23, 1967

Nationality: Austrian

Civil Status: Married

Education:

1991: „Dipl.-Ing." at the Technical University of Vienna, Chemistry/Chemical Engineering (End of Study „Technical Chemistry")

1991 - 1996 Research Assistant and University Assistant at the Technical University of Vienna

1996: „Dr.", Technical University of Vienna, Chemistry/Chemical Engineering

since 1996: Environmental Technologies Expert at the Austrian Federal Environment Agency

Professional Experience Record:

National Expert in the Information Exchange under the IPPC Directive (Art. 16 (2), 96/61/EC):

- BAT Glass Industry
- BAT Chlor-Alklai
- BAT Large Volume Organic Chemicals
- Expert for Cross Media and Economic Aspects

Member of the Austrian Chemical Society

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	medium	medium	medium

WACHTER, Bruno; CENTRIC AUSTRIA

Profession: Chemical Engineer
Date of Birth: Nov 6, 1960
Nationality: Austrian
Civil Status: unmarried

Education:

1980-1989: Technical University Graz, Austria; Dipl.-Ing. Chemical Engineering

1990-1996: Technical University Graz, Austria; Ph.D.: A Possible Recommended Reactive Liquid/Liquid System Zinc/Di (2-ethylhexyl) Phosphoric Acid/n-Dodecane: Modelling of Equilibrium by Means of SIMUSOLV"

Professional Experience Record:

01/90-06/97: Assistent at Technical University Graz
- reaktice liquid-liquid extraction (solvent extraction) for the purification of waste waters polluted by heavy metals;
- member of international network of solvent extraction experts;
- lectures on thermical unit operations in chemical & enironmentla engineering.

07/97-12/98: Project Co-ordinator at Austrian Cleaner Production Center in Graz
- Implementation of Best available Technologies (BATs) in industry;
- member of the international PREPARE-network (Preventive Environmental Protection Approaches in Europe)

01/99-02/99: Project Co-ordinator Austrian Federal Ministery of Science; Dept of Energy & Environmental Technologies in Vienna:
- Cleaner Production an Ecodesign in the 5th Frameprogramme of the EC;
- Assessment tools for environmentally friendly product design (LCA-life cycle analyses)

03/99-02/00: Researcher at Austrian Research Centers Seibersdorf (ARCS); Dept for sustainable Product Development
- Recycling-methods for mass consumer products (e.g. small & medium sized electrical motors);
- sustainable construction

Since 03/00: Project director at CENTRIC AUSTRIA

Resonsible e. g. for:
- Ecoprofit Klagenfurt-Carinthia. Training and consulting project to green local industry
- sustainable energy supply of city of Chernovtsy (Ukraine)

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good	good	good

WEIHS, Gerhard; CENTRIC AUSTRIA

Profession: environmental engineer; managing director of CENTRIC AUSTRA
Date of Birth: May 17, 1960
Nationality: Austrian
Civil Status: married, one child

Education:

1978-1985 University of Innnsbruck, Austria;
- Ph.D. Philosophie and Philosophie of Science

1990-1992 Technical University of Graz, Austria
- Master´s Degree Environmental Engineer

Professional Experience Record:

Since 1997: Managing Director of CENTRIC AUSTRIA – Carinthian Environmental Training and Infrastructure Center in St. Veit/Glan, Austria:
- General managing tasks, budget planning and executing, international project management

1995 –1997: Director of Carinthian Environmental School in St. Veit/Glan.
- Development of courses, managing the teachers, shedule planning, budget planning and executing, teaching (see below)

1993 - 1995: Teacher at Carinthian Environmental School in St. Veit/Glan:
- Lecturer for Environmental History, Environmental Policy, Waste Management, Energy Saving, Cleaner Production

Since 1994: Owner of Alekto Publishing und A.I.D.A. Marketing and Promotion Agency Ltd. in Klagenfurt, Austria
- Several Publications in the field of Environmental Protection in Industry, Scientific Publications, belles-lettres; public relations for enterprises and organisations, event management, etc.

Since 1993: Projectmanager (part time) of the Municipality of Klagenfurt, Austria Department of Environment

Resonsible e. g. for:
- Ecoprofit Klagenfurt. Training and consulting project to green local industry
- Energy plan for the City of Klagenfurt
- Start management and development of the local energy agency Klagenfurt
- Policy advice: e. g. waste management, public awareness
- Curator for Environmental fair Factor 4+

1986 – 1997: Managing director of Idea Consult – Institut for applied research in Klagenfurt, Austria:
- Several studies on social empirics, policy advice, environmental research

Language Skills:

Language	Speaking	Reading	Writing
German	mother tongue		
English	good	good	good

WOLDENDORP, Hans-Erik; European Commission

Profession: lawyer
Date of Birth: May 4, 1960
Nationality: Dutch
Civil Status: unmarried

Education:

university

Professional Experience Record:

Lawyer in several Dutch municipalities, the Dutch Coucncil of State, the University of Utrecht, the Dutch Ministries of Agriculture and of the Environment and the European Commission. Most of the time: Dutch Ministry of the Environment.

Language Skills:

Language	Speaking	Reading	Writing
Dutch	mother tongue		
English	Reasonably	Good	Reasonably
French	Rather bad	Good	Rather bad
German	No	Reasonably	No