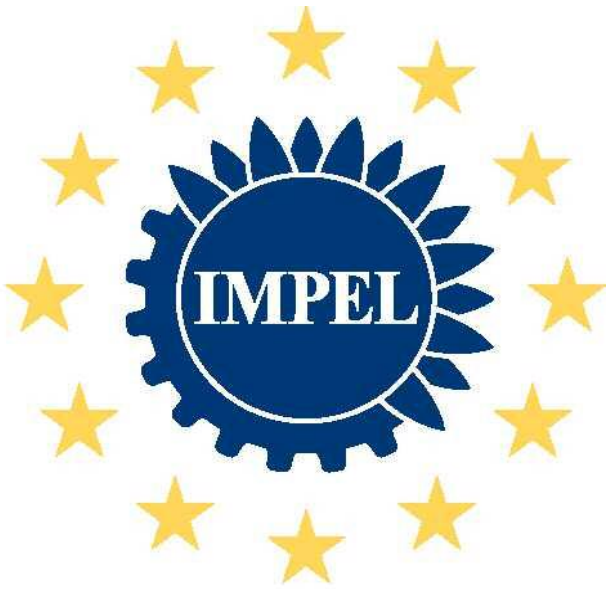
IMPEL-WORKSHOP
ON THE USE OF VOLATILE ORGANIC COMPOUNDS-VOC



European Union Network for
the Implementation and Enforcement
of Environmental Law

March 2006

INTRODUCTION

The European Union Network for the Implementation and Enforcement of Environmental Law is an informal network of the environmental authorities of EU Member States, acceding and candidate countries, and Norway. The European Commission is also a member of IMPEL and shares the chairmanship in its Plenary Meetings.

The network is commonly known as the IMPEL Network

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on certain of the technical and regulatory aspects of EU environmental legislation. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. It promotes the exchange of information and experience and the development of greater consistency of approach in the implementation, application and enforcement of environmental legislation, with special emphasis on Community environmental legislation. It provides a framework for policy makers, environmental inspectors and enforcement officers to exchange ideas, and encourages the development of enforcement structures and best practices.

Information on the IMPEL Network is also available through its web site at:
http://europa.eu.int/comm/environment/impel

Document Page:

Title report	**Number report:** Year/number Year = Year of Work programme Number = Number of project in the workprogramme
IMPEL workshop on the use of volatile organic compounds – VOC, Salzburg 2005	
Project Manager/Authors Mr. Guenter Dussing, Land Salzburg, Austria **Project Group Members** Gross Robert (Land Salzburg), Hafner Wolfgang (Land Carinthia, Klagenfurt), Muchitsch Wilhelm (Ministry for Economic Affairs and Labour, Vienna), Rosenberger Harald (Land Lower Austria), Ruthner Helmut (City of Salzburg), Tizek Heinz (Vienna)	Report adopted at IMPEL Plenary Meeting: *add date and place* **Number of pages** Report: 18 Annexes: 10

Executive Summary

This report describes the topics and the results of the IMPEL workshop in September 2005 in Salzburg. The focal point of this project was the information about VOC - regulations and exchange of experience between the participating inspectors and technical experts of EU-Member States.
The workshop was attended by 50 people from almost all IMPEL member states, the European Commission and Switzerland.

The programme consisted of information about the VOC-Directive and the implementation in 3 EU-Member States (Se, It and At) on the first half day, followed by discussions of case studies, which have been prepared by the project group members, in small working groups. On the second day the results of the working groups have been presented at the plenary followed by an intensive discussion.

Main results are:

- There are differences in national regulations (esp. Emission Limit Values)
- Different interpretations of some terms (e.g. fugitive emissions, installation)
- There should be a review process of the VOC-Directive

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Summary

On March 11th 1999 the Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations (VOC-Directive) was adopted.

In Austria two national regulations concerning VOC already existed before adopting the VOC-Directive. During the transposition process many discussions with administrative bodies and industries took place. Especially the Austrian Chamber of Commerce tried to avoid a so called “golden plating” of the VOC-Directive. Therefore the Directive was transposed into national law in July 2002.
In the year 2000 a national IMPEL network for VOC was established to accompany the transposition process and to have a discussion forum for technical experts and inspectors.

In the year 2004 a proposal for an international meeting was discussed within the national network and there was an agreement to organise a workshop with the support of IMPEL. A project team of 8 people was established and who decided to organise a 2 days workshop in Salzburg/Austria.
The focal point was an intensive discussion of questions and problems concerning VOC with the help of case studies. The activities "coating", "printing", "pharmaceutical industry" and "surface cleaning" were selected and case studies were prepared by members of the project team.

During the IMPEL-workshop, information about VOC-regulations in the Directive and some national laws were presented to the participants. The main focus was the discussion of the prepared case studies in small working groups, which consisted of between 8 and 16 members each.

The main results were:
- there are partially great differences between the national regulations in the EU-MS.
- there are still different interpretations of some terms (eg installation, fugitive emission).
- beneath national VOC-regulations also other common requirements for emission reduction exist (eg dust/particles).
- some requirements in the directive have been criticized and there should be a review process.

The participants expressed their satisfaction with the procedure and results of the IMPEL workshop. For many people it is still a learning process because of the complexity of the VOC-regulations.
In the future an information exchange forum for inspectors and technical experts should be established and review process of the VOC-directive after the transition period in 2007 is recommended.

1. Project Background

1.1 Background

Action at Community level in accordance with Article 130r of the Treaty is necessary, if air pollution due to volatile organic compounds in one Member State is not to influence the quality of air and water of other Member States.
Volatile organic compounds in the ambient air can be harmful for public health and/or contribute to the local and transboundary formation of photochemical oxidants in the boundary layer of the troposphere.
Therefore, preventive action is required to protect public health and the environment against the consequences of particularly harmful emissions from the use of organic solvents and to guarantee citizens the right to a clean and healthy environment.

Emissions of organic compounds can be avoided or reduced in many activities and installations because potentially less harmful substitutes are available or will become available within the coming years.
Where appropriate substitutes are not available, other technical measures should be taken to reduce emissions into the environment as much as economically and technically feasible.
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;

Therefore the Council of the European Union adopted (on March 11th 1999) the Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations (VOC-Directive).

Before the VOC-Directive was implemented in Austria in July 2004, 2 national regulations concerning solvents existed. During the transposition process almost all national emission standards for VOC had to be changed and therefore caused some problems in the field of administration.

To cover all the different VOC-problems, which were expected to occur in the permitting and inspection procedures, in Austria a national network was established. The so called "National IMPEL Network for VOC" now has approximately 20 members out of all provinces (Länder) and almost all their capitals.
The network meets 2 times a year for 1 ½ days and the members discuss questions and problems in the field of VOC. The special historical situation of national regulations about VOC in Austria is only one reason, why so many problems arose.
In the spring meeting 2004 the idea was born to organise an international VOC-workshop, where all the problems and questions can be discussed with colleagues from other EU-MS. IMPEL is the only organisation within the European Union to support this kind of project.

The ToR first was presented at the Cluster I meeting in Warsaw in autumn 2004 and finally adopted at the IMPEL plenary meeting in December 2004. Invitations and information material were sent out in April 2005. Until the end of June more than 40 participants sent their registration forms to the project lead.

1.2 Project Team

Dussing Günter (Land Salzburg, Dep. of Environmental Protection, POB 527, 5010 Salzburg, Austria)

Gross Robert (Land Salzburg, Dep. of Environmental Protection, POB 527, 5010 Salzburg, Austria)

Hafner Wolfgang (Land Carinthia, Klagenfurt, Dep. of Environmental Protection, Bahnhofstraße 5, 9020 Klagenfurt)

Muchitsch Wilhelm (Ministry for Economic Affairs and Labour, Dep. for Technical Matters of the Industrial Code, Stubenring 1, 1011 Wien)

Rosenberger Harald (Land Lower Austria, Dep. BD-4 Environmental Technique, Schwartzstr. 50, 2500 Baden of Air Pollution)

Ruthner Helmut (City of Salzburg, Dep. of Industrial Engineering, Auerspergstr. 7, 5024 Salzburg)

Tizek Heinz (Vienna, MA-22 Dep. of Environmental Protection, Ebendorferstraße 4, 1082 Wien)

1.3 Preperatory Work

Five meeting with all project team members were necessary from September 2004 until August 2005. In the first meeting the Terms of Reference, the scope and procedure of the international meeting were discussed and it has been decided to organise a 2 days workshop.

The next step was to ask for financial contributions from the Land Salzburg and other organisations. The Dep. of Environmental Policy of the Chamber of Commerce agreed to support this project and offered to have the workshop in their seminar rooms and to arrange the registration.

During the 2nd meeting the case studies and the organisation (invitations, contributions from other EU-MS, timetable, etc.) were discussed. The 3rd and 4th meeting only involved preparation of the case studies. In the last meeting before the workshop all open questions were discussed and some organisational problems were solved.

1.4 Participating Countries

Austria
Belgium
Croatia
Cyprus
Czech Republic
Denmark

Estonia
Finland
France
Germany
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

EC
Switzerland

Participants from Bulgaria and United Kingdom could not attend the meeting.

The List of participants is in Annex 2.

1.5 Financing of the project.

Costs of the preparatory work of the project team were covered by the respective Länder and cities of Austria.

The costs of registration and the meeting rooms were covered by the Chamber of Commerce of Salzburg.

The dinner on the 2nd day was paid by the Land Salzburg.

All other costs, especially travelling and accommodation of the participants of EU member states, were covered by IMPEL (max. 40 persons).

2. Procedure of the Workshop

2.1 Timetable

We	21.09.05	18:00 Registration
Thu	22.09.05	09:00 Welcome and Organisation 09:30 Information about the VOC Directive 10:00 Implementation in Austria 10:30 break 11:00 Implementation in Sweden 11:30 Implementation in Italy 12:00 Presentation of the VOC-Regulation in Switzerland 12:20 Presentation of the project team and the case studies 12:30 Lunch 14:00 Discussion of the case studies in working groups (WG) 18:00 End of the 1. Day 20:00 Dinner
Fri	23.09.05	09:00 Presentation and discussion of the results of the 1. WG 09:45 Presentation and discussion of the results of the 2. WG 10:30 Break 11:00 Presentation and discussion of the results of the 3. WG 11:45 Presentation and discussion of the results of the 4. WG 12:30 Lunch 14:00 Final discussion 16:30 Summary 17:00 End of the VOC-Workshop

2.2 VOC-Directive
Annex 2.

2.3 Information about the Implementation of the VOC-Directive in Austria
Annex 3

2.4 Information about the Implementation of the VOC-Directive in Sweden
Annex 4

2.5 Information about the Implementation of the VOC-Directive in Italy
Annex 5

2.6 Information about the VOC-Regulation in Switzerland
Annex 6

3. Case Studies, Discussions and Results

The case studies were distributed to the participants several weeks before the workshop started and they had to decide which working group they want to attend.

The presentation of the case studies was made by one of the preparatory group.

The chair (C) for the discussion and the rapporteur (R) for the presentation of the results of the working group also were taken by persons of the preparatory group

3.1 Working group "Printing":

A case study for the activity "Heatset web offset printing" was prepared by Robert Gross and Harald Rosenberger.

Case study, discussion points und the results you find in Annex 7.

Participants:

	First Name	**Surname**	**Country**
1.	Martine	BLONDEEL	Belgium
2.	João Paulo	CARVALHO	Portugal
3.	Christian	DE LAAT	Netherlands
4.	Monica	FERREIRO-GARCIA	EC
5.	Ursula	FINSTERWALD	Switzerland
6.	Stelios	GEORGHIADES	Cyprus
7.	Robert	GROSS (C)	Austria
8.	Tadija	PENIC	Croatia
9.	Harald	ROSENBERGER (R)	Austria
10.	Dinka	TODOROVA	Bulgaria
11.	Karol	VISACKY	Slovakia

3.2 Working group "Coating":

Case studies for the 2 most used activities "Coating of vehicles" and "Coating of wooden surfaces" were prepared by Helmut Ruthner and Guenter Dussing.

Case study, discussion points und the results you find in the Annexes 8, 8A and 8B.

Participants:

	First Name	**Surname**	**Country**
1.	Janis	BLAHINS	Latvia

2.	Pierre	DORNSEIFFER	Luxembourg
3.	Günter	DUSSING (C)	Austria
4.	Raluca	POPESCU	Romania
5.	Jørn L.	HANSEN	Denmark
6.	Peter	IMRICH	Slovakia
7.	Anneli	KARJALAINEN	Finland
8.	Colman	MAC CARTHY	Ireland
9.	Christina	MALLIA	Malta
10.	Rene	RAJASALU	Estonia
11.	Robert	ROSENQVIST	Sweden
12.	Helmut	RUTHNER (R)	Austria
13.	Richard	SCHLACHTA	Germany
14.	Lucja	STASZKIEWICZ-SZWAROCKA	Poland
15.	David	VAZQUEZ VILARELLE	Spain
16.	Gernot	WILFLING	Austria
17.	Audrius	ZELVYS	Lithuania

3.3 Working group "Pharmaceutical Industry":
A case study for the activity "Manufacturing of pharmaceutical products" was prepared by Wolfgang Deimböck and Heinz Tizek.

Case study, discussion points und the results you find in Annex 9.

Participants:

	First Name	**Surname**	**Country**
1.	Flaviano	D'AMICO	Italy
2.	Wolfgang	DEIMBÖCK (C)	Austria
3.	Ivan	HRABAL	Czech Republic
4.	Ingrid	JEDVALL	Sweden
5.	Andreja	KRAMAR	Slovenia
6.	Wilhelm	MUCHITSCH	Austria
7.	Lionel	PREVORS	France
8.	Heinz	TIZEK (R)	Austria

3.4 Working group "Surface Cleaning":

A case study for the activity "Surface cleaning with halogenated organic compounds was prepared by Wofgang Hafner and Gernot Wurm.

Case study, discussion points und the results you find in Annex 10.

Participants:

	First Name	Surname	Country
1.	Raliza	DAMYANOVA	Bulgaria
2.	Iveta	GALOVICOVA	Slovakia
3.	Wolfgang	HAFNER (C)	Austria
4.	Yvonna	HLINOVA	Czech Republic
5.	Friedhelm	POHL	Germany
6.	Regina	STEINBAUER	Austria
7.	Karol	VISACKY	Slovakia
8.	Iris	WINZELY	Austria
9.	Gernot	WUIRM (R)	Austria
10.	Lenka	ZITKOVA	Czech Republic

4. Conclusions

During the IMPEL VOC – workshop the differences in the national regulations in EU-Member States and the practical approaches have been discussed. Especially because of the results of the discussions of the case studies some improvements in the EU-legislation are suggested:

1. Many EU-Member States just have implemented the VOC-Directive and therefore have limited experience with enforcement.

2. The aim of the Directive is to reduce VOC-emissions as much as possible, but the Directive is not the ideal instrument because of the complicated regulations.

3. The compliance with some emission limit values should be checked on the basis of best available technology (e.g.: is there a technical reasonable solution or can it only be managed with enormous effort).

4. There should be a review process of the VOC-Directive after October 2007 especially for respectively because of:
- discussing the advantages and disadvantages of reduction schemes used;
- there should be a clear definition of "fugitive emissions" (e.g.: it should be discussed, if the German way of the definition is applicable also for the VOC-Directive).
- discussing the effects of thresholds and emission limit values;
- importance of solvent management plans and the consequences;
- the multiplication factors for the reduction scheme (the reference and for the target emissions for some activities);
- possibilities of exceptions:

5. Some (experienced) countries mentioned, that it would had been better to implement a national plan to reduce the VOC-emissions.

April 12th 2006
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VOC – Directive

Council Directive 1999/13/EC

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Implementation of the VOC-Directive in Austria

MinR Dipl.-Ing. Wilhelm Muchitsch

Federal Ministry for Economic Affairs and Labour

1. The Austrian Administration

The basis of the Austrian administration are the District Authorities (Bezirkshauptmannschaften) of the Länder (Bundesländer) and the municipalties (Gemeinden). The Industrial Code (Gewerbeordnung 1994, BGBl. Nr. 194/1994) is a federal matter and comes traditionally within the area of responsibility for the Federal Ministry for Economic Affairs and Labour (Bundesministerium für Wirtschaft und Arbeit, BMWA). The enforcement of the Industrial Code is done by indirect federal administration by the District Authorities. They are the "One-Stop-Shop" for all matters of the Industrial Code e.g. business licence, authorisations of plants, complaints of citizens about plants, but also for monitoring the compliance of the plants and sentencing the operators of the plants.

To get an authorisation, the operator of the plant has to put in an application with plans and description of the plant and their emissions before being constructed. The District Authority is obliged to investigate in a case-by-case procedure by the help of technical and medical experts that there are for the neighbourhood no risks of death, risks of health and even no unreasonable annoyance. There must be a public announcement on the blackboard of the municipalty and a written invitation to all neighbours for the local inspection. The operator, all neighbours which raise an objection to the authorisation and the inspectorate for health and safety protection at the workplace (Arbeitsinspektorat) are party to the proceedings. Only the parties can appeal against the authorisation to the Independent Administration Senate of the Land (Bundesland). The decision of the Independent Administration Senate can only be cancelled or changed by the Highcourt of Administration (Verwaltungsgerichtshof) in an extraordinary course of law. Each party has to get a copy of the authorisation with a description of the plant and all conditions on the operation of the plant (e.g. emission value limits for waste gases, waste water, and noise (always dependent to the special case and to the state of art)). These conditions remain on the plant even when it is sold. Each modification of the plant needs an additional authorisation.

To speed up the proceedings the Industrial Code opens the Federal Minister for Economic Affairs and Labour in special cases the possibility to regulate in general the emissions of plants by an ordinance (Verordnung). But this requires the approval of the Federal Minister for Environment (exactly: Minister for Agriculture, Forestry, Environment and Water).

2. The Implementation of the VOC-Directive

When the VOC-Directive entered into force there existed in Austria two ordinances with partly more stringent and partly less stringent regulations: one for the use of solvents associated with coating activities (Lackieranlagen-Verordnung, BGBl. Nr. 873/1995), the other for the use of chlorinated and/or fluorinated hydrocarbons (CKW) associated with dry cleaning and surface cleaning (CKW-Anlagen-Verordnung 1994, BGBl. Nr. 865/1994). The political problem with the implementation has been on the one hand to save the more stringent regulations for getting the approval of the Minister for Environment and on the other hand not to strengthen the Directive too much (no golden plating was the demand of the industry). Therefore we have been late with the implementation. But that was also an advantage for us, because we could look over the fence to Germany. So that's why our VOC-Installation-Ordinance (VOC-Anlagen-Verordnung, VAV) is similar to the german one (31.BimSchV).

Because of the second existing ordinance (CKW-Anlagen-Verordnung) we decided to exempt the halogenated organic solvents from the VAV and make an own ordinance for those (HKW-Anlagen-Verordnung, HAV).

The principle differences of the VAV to the VOC-Directive are:

- Lower solvent consumption thresholds (due to the structure of the Austrian industry)
- Sometimes more stringent emission limit values (due to the emission limit values of the Lackieranlagen-Verordnung and the state of the art)
- No possibility for a national plan
- Reduction schemes and simplified reduction schemes for special VOC-installations
- Special regulations for installations falling below the solvent consumption threshold (down to 500 kg solvent consumption)

In the HAV, the follower of the CKW-Anlagen-Verordnung, are not only the regulations of the VOC-Directive implemented but also the stringent regulations for the use of CHC's of its predecessor.

3. The ordinance of the Minister for Economic Affairs and Labour for the implementation of the Council Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in plants (VOC-Anlagen-Verordnung – VAV), Federal Gazette of Law Part II Nr. 301/2002 (BGBl. II Nr. 301/2002)

The Ordinance is divided in four parts

1. scope and definitions,
2. regulations for installations exceeding the solvent consumption threshold,
3. regulations for installations falling below the solvent consumption threshold,
4. temporary provisions for existing installations and final regulations

and eight annexes

1. list of activities,
2. thresholds and emission controls,
3. reduction scheme,
4. solvent management plan,
5. requirements for monitoring,
6. – 8. three forms for the report due to the questionaire of the Commission (report of the operator, report of the District Authority, report of the Landeshauptmann).

Part 1: Scope and Definitions

To fall into the scope (§ 1) an installation must fulfil two fundamental conditions:

- the use of VOC and
- an activity mentioned in Annex 1.

Further on there is distinguished between installations exceeding the solvent consumption threshold and installations falling below the solvent consumption threshold but only down to 500 kg of annual solvent consumption.

The definitions (§ 2) are identical to the definitions of the VOC-Directive but in alphabetical order. There are additionally some typical Austrian legal definitions like Sachkundiger (expert).

Part 2: Regulations for installations exceeding the solvent consumption threshold

Limitation of Emissions

§ 3 is the basis for the emission limit values, the fugitive emission values and the total emission limit values laid down in Annex 2 or a reduction scheme laid down in Annex 3.

But there are also three possibilities for exceptions: a possibility for exceptions from the limit values under the conditions that two or more different activities are carried out in the plant and the total emissions (mass flow) of all activities do not exceed those that would have resulted had the limit values been applied.

An exception from the fugitive emission value can be made if this value is not technically and economically feasible and risks to human health or the environment are not to be expected.

For some special coating activities which cannot be operated under contained conditions one can find in § 3 an exception from the limit values under the condition that this activity is done according to the state of the art.

All exceptions need an application of the plant operator to the District Authority and if he demonstrates the conditions to the satisfaction of the authority he *can* get a written permit (authorisation) but the District Authority is not obliged to do so.

The requirement for the substitution of certain dangerous solvents is laid down in § 4. If this is impossible there are special emission limit values of 2 mg/m³ respectively 20 mg/m³.

Measurement and Monitoring

The concentration of total carbon, particles (only from coating installations), CO and NO_x (only from waste gas incinerators) has to be measured first time after the installation has started to operate and since this time every three years (§ 4). The measurement covers three one-hour-averages. The emission limit values shall be considered to be complied with if the average of all readings does not exceed the emission limit value and none of the hourly averages exceeds the emission limit value by more than a factor of 1,5 (Annex 5). For installations with an annual solvent consumption less than 2000 kg a calculation instead of the measurement could be done (Annex 5).

Installations with a final hourly discharge of more than 10 kg C (total carbon) have to be measured continuous for compliance. Compliance is given if none of the averages over 24 hours exceeds the emission limit value and none of the half hour averages exceeds the emission limit value by more than a factor of 1,5.

For each installation respectively each activity a solvent management plan (Annex 4) has to be carried out annually. The operator of the plant is obliged to send a copy of this solvent management plan to the District Authority at March of the following year latest. He has also once a year the duty to give an external expert the task to monitor the compliance with the fugitive emission value, the total emission limit value or the reduction scheme on the basis of his solvent management plan. The measuring reports, the solvent management plan and the results of the compliance-monitoring have to be stored at the plant's office for at least three years.

In this part you will also find a regulation for the diversion of the waste gases from VOC-installations (§ 6) and the obligation for the report to the European Commission (§ 7).

Part 3: Regulations for installations falling below the solvent consumption threshold

Limitation of Emissions

VOC-vapours should be drawn off as near as possible from the work place and diverted (at least over the roof of the building). The following table shows the emission limit values for total carbon and particles (only from coating activities) in the waste gas (§ 8):

	new installations	existing installations
organic solvents (mg C/m³)	100	150
particles (mg/m³)	3	5

In special cases the authority can allow 150 mg C/m³ even for a new installation.

Measurement and Monitoring

The concentration of total carbon and particles (only from coating installations) has to be measured first time after the installation has started to operate and afterwards the installation has to be checked by an external expert every five years (§ 9). The measurement covers three one hour averages. The emission limit values shall be considered to be complied with if the average of all readings does not exceed the emission limit value and none of the hourly averages exceeds the emission limit value by more than a factor of 1,5 (Annex 5). For installations less than 2000 kg annual solvent consumption a calculation (Annex 5) instead of the measurement could be done (§ 9).

For each installation respectively each activity a less stringent solvent management plan with an accuracy of ± 20 % has to be carried out annually.

The operator of the plant is only obliged to send a copy of this solvent management plan to the District Authority if the threshold of the annual solvent consumption is crossed. The report of the first measurement must be stored for the duration of the existence of the installation, the solvent management plan and the results of the five year check have to be stored at the plant's office for at least five years.

Part 4: Temporary provisions for existing installations and final regulations

Existing installations must comply with the emission limits laid down in Annex 2 no later than 31 October 2007.

There are also several special regulations due to those installations which were subject to the Lackieranlagen-Verordnung. In some cases there was a shorter temporary provision (31 October 2004).

The ordinance entered into force at 1 September 2002. At the same time the Lackieranlagen-Verordnung was repealed.

Annex 1: List of Activities

The list is identical to the list of activities in Annex I of the VOC-Directive. The activities are numbered and these numbers correspond with the numbers in the other annexes.

Annex 2: Thresholds and Emission Controls

Annex 2

(§ 1, § 2 Z 5 and 16, § 3 Abs. 1 to 3, 6 and 7, § 4 Abs. 1, § 5 Abs. 1 and 6, § 9 Abs. 2, § 10 Abs. 5)

I. Emission Controls for VOC

A. Threshold and Emission Controls

Number	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases 1) (mg C/m³) if x/y: Incineration/ Others	Fugitive Emission values (percentage of solvent input)		Total emission limit values		Remarks
				New 2)	Existing	New 2)	Existing	1) Referring to real O_2 2) At the time of enter into force not authorized plants or installations
1.1	Heatset web offset printing (> 5)	> 5 – 25 > 25	30/75 20	30 [1)] 30 [1)]				[1)]Solvent residue in finished product is not to be considered as part of fugitive emissions
1.2	Publication rotogravure (> 5)	> 5	30/75	10	15			
1.3	Other rotogravure, flexography, rotary screen printing, laminating and varnishing units, rotary screen printing on textiles/cardboard (> 5)	> 5 – 10 > 10	30/75 (90[1)]) (100[2)]) 30/75 (90[1)]) (100[2)])	25 20				[1)]for biological waste gas cleaning [2)]For installations with ethanol and /or propanol only used as solvent

Number	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases 1) (mg C/m³) if x/y: Incineration/ Others	Fugitive Emission values (percentage of solvent input)		Total emission limit values		Remarks
				New 2)	Existing	New 2)	Existing	1) Referring to real O_2 2) At the time of enter into force not authorized plants or installations
2	Surface cleaning (except halogenated solvents) (> 2)	> 2 – 5 > 5	30/75 [1)] 30/75 [1)]	20 [1)] 15 [1)]				[1)] Installations which demonstrate to the authority that the average organic solvent content of all cleaning material used does not exceed 30 % by weight are exempt from application of these values
3	Vehicle coating (< 15) and vehicle refinishing (> 0,5)	> 0,5 – 5 > 5	50 [1)] 30/50 [1)]	25 25				[1)] Compliance should be demonstrated based on 15 minute average measurements.
4	Coil coating (> 5)	> 5 - 25 > 25	30/75 30/50 (100 [1)])	5 5	10 10			[1)] For installations which use techniques which allow reuse of recovered solvents

Number	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases 1) (mg C/m³) if x/y: Incineration/ Others	Fugitive Emission values (percentage of solvent input)		Total emission limit values		Remarks
				New 2)	Existing	New 2)	Existing	1) Referring to real O_2 2) At the time of enter into force not authorized plants or installations
5	Other coating, including metal, plastic, textile [1)], fabric, film and paper coating (> 5)	> 5 – 10 > 10	30/75 [2)] 30/75 [2)]	25 [2)] 20 [2)]				[1)] Rotary screen printing on textile is covered by 1.3 [2)] Coating activities which cannot be applied under contained conditions (such as painting of big bulky goods, shipbuilding, aircraft painting) may be exempted from these values in accordance with § 6 Abs. 7
6	Winding wire coating (> 5)	> 5	30/75			10 g/kg [1)] 5 g/kg [2)]		[1)] Applies for installations where average diameter of wire ≤ 0,1 mm [2)] Applies for all other installations
7	Coating of wooden surfaces (> 5)	> 5 – 25 > 25	30/75 [1)] 30/75 [1)]	25 20				[1)] Emission limit applies to coating application and drying processes operated under contained conditions
8	Dry cleaning (except halogenated solvents)					20 g/kg [1)]		[1)] Expressed in mass of solvent emitted per kg of product cleaned and dried

Number	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases 1) (mg C/m³) if x/y: Incineration/ Others	Fugitive Emission values (percentage of solvent input)		Total emission limit values		Remarks
				New 2)	Existing	New 2)	Existing	1) Referring to real O_2 2) At the time of enter into force not authorized plants or installations
9	Wood impregnation (> 5)	> 5	30/100 [1)]	40		11 kg/m³		[1)] Does not apply for impregnation with creosote
10	Coating of leather (> 5)	> 5 – 25 > 25	30/75 30/75			85 g/m² (150 g/m²) [1)] 75 g/m² (150 g/m²) [1)]		Emission limits are expressed in grams of solvent emitted per m² of product produced [1)] For leather coating activities in furnishing and particular leather goods used as small consumer goods like bags, belts, wallets, etc.
11	Footwear manufacture (> 5)	> 5				25 g per pair		Total emission limit values are expressed in grams of solvent emitted per pair of complete footwear produced
12	Wood and plastic lamination (> 5)	> 5	30/75			5 g/m²		
13	Adhesive coating (> 5)	> 5 – 15 > 15	30/50 (100 [1)]) 30/50 (100 [1)])	25 20				[1)] For installations which use techniques which allow reuse of recovered solvents
14	Manufacture of coating preparations, varnishes, inks and adhesives (> 10)	> 10 – 1000 > 1000	30/100 30/100	3 1		3 % of solvent input 1 % of solvent input		The fugitive emission value does not include solvent sold As part of a coating preparation in a sealed container

Number	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases 1) (mg C/m³) if x/y: Incineration/ Others	Fugitive Emission values (percentage of solvent input)		Total emission limit values		Remarks
				New 2)	Existing	New 2)	Existing	1) Referring to real O_2 2) At the time of enter into force not authorized plants or installations
15	Rubber conversion(> 5)	> 5	20 (100 [1)])	25 [2)]		25 % of solvent input		[1)] For installations which use techniques which allow reuse of recovered solvents [2)] The fugitive emission value does not include solvent sold as part of products or preparations in a sealed container
16	Vegetable oil and animal fat extraction and vegetable oil refining activities (> 10)	> 10	30/75			Animal fat: 1,5 kg/t Castor: 3,0 kg/t Rape seed: 1,0 kg/t Sunflower seed: 1,0 kg/t Soya beans (normal crush): 0,8 kg/t Soya beans (white flakes): 1,2 kg/t Other seeds and vegetable matter: Maximum: 3,0 kg/t [1)] 1,5 kg/t [2] 4,0 kg/t [3)]		[1)] Total emission limit values for installations processing individual batches of seeds and other vegetable matter should be set by the authority on a case-by-case basis, applying the best available techniques [2)] Applies to all fractionation processes excluding de-gumming (the removal of gums from oil) [3)] Applies to de-gumming
17	Manufacturing of pharmaceutical products (> 10)	> 10	20 (100 [1)])	5 [2)]	15 [2)]	5 % of solvent input	15 % of solvent input	[1)] For installations which use techniques which allow reuse of recovered solvents [2)] The fugitive emission limit value does not include solvent sold as part of products or preparations in a sealed container

B. Coating activities in mass production of vehicles, truck cabins, vans and trucks, busses and track vehicles

The total emission limit values are expressed in terms of grams of solvent emitted in relation to the surface area of product in square meters and in kilograms of solvent emitted in relation to the car body.

The total emission limit value refers to all process stages carried out at the same installation from electrophoretic coating, or any other kind of coating process, through to the final wax and polish of top coating inclusive, as well as solvent used in cleaning of process equipment, including spray booths and other fixed equipment, both during and outside production time. The total emission limit value is expressed as the mass sum of organic compounds per m^2 of the total surface area of coated product and as the mass sum of organic compounds per car body and refers to an annual average.

Number	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/m^3) if x/y: Incineration/ Others	Fugitive Emission values (percentage of solvent input)	Total emission limit values
18.1	Coating of new vehicles (> 15)	> 15	30/75		35 g/m^2
18.2	Coating of new truck cabins (> 15)	> 15	30/75		45 g/m^2
18.3	Coating of new vans and trucks (> 15)	> 15	30/75		70 g/m^2
18.4	Coating of new busses (> 15)	> 15	30/75		150 g/m^2
18.5	Coating of track vehicles (> 15)	> 15	30/75		110 g/m^2

Vehicle coating installations below the solvent consumption thresholds in the table above shall meet the requirements for the vehicle refinishing sector (part A Nr. 3).

II. Emission controls for particles

The emission of particles in waste gases from installations of Nr. 3 to 7 and 18 shall not exceed 3 mg/m³ at new installations and 5 mg/m³ at existing installations.

III. Emission controls for other pollutants

Using incineration equipment for waste gas cleaning the concentration of the cleaned waste gas shall not exceed for

1. CO ..... 100 mg/m³ and
2. NO_x (expressed as $N0_2$) ..... 100 mg/m³,
   with solvents containing N atoms ..... 150 mg/m³.

Compliance should be demonstrated based on 30 minute average measurements (referring to real O_2).

Annex 3: Reduction Scheme

Part I: Principles and general requirements

Fundamental condition is that the reduction must be at least the same as resulted by the application of the emission limits.

1. The reference point for emission reductions should correspond as closely as possible to the emission which would have resulted had no reduction action been taken.
2. Other reduction schemes as laid down in part 2 should apply the time frame of part 2.
3. Where substitutes containing little or no solvent are still under development with a timely view, a time extension must be given to the operator by the authority to implement his emission reduction plans.

Part II: Reduction scheme for special VOC-installations

In case of applying coating materials with constant content of mass of solids the following scheme can be used.

1. The operator shall forward an emission reduction plan which includes in particular decreases in the average solvent content of the total input and/or increased efficiency in the use of solids to achieve a reduction of the total emissions from the installation to a given percentage of the annual reference emissions, termed the target emission. This must be done on the following time frame:

Time period		Maximum allowed total annual emissions
New installations	Existing installations	
From enter into force	from 1.11.2005 (1.11.2003)[1)]	Target emission x 1,5
from 1.11.2004	from 1.11.2007 (1.11.2005)[1)]	Target emission

[1)] For special installations which were subject to the Lackieranlagen-Verordnung

2. The annual reference emission is calculated as follows:

annual reference emission = kg solid/y • multiplication factor

The total mass of solids in the total quantity of coating and /or ink, varnish or adhesive consumed in a year is determined. Solids are all materials in coatings, inks, varnishes and adhesives that become solid once the water or the volatile organic compounds are evaporated.

The annual reference emissions are calculated by multiplying the mass of solids by the appropriate multiplication factor listed in the table below.

Number	Activity	Multiplication factor	Percentage
1.1	Heatset web offset printing	1	(30 + 5) %
1.2	Publication rotogravure	4	(10 + 5) % Existing installations: (15 + 5) %
1.3.1	Rotogravure	4	>5-10 t/y: (25 + 5) % >10 t/y: (20 + 5) %
1.3.2	flexography	4	
1.3.3	Rotary screen printing	1,5	
1.3.4	Laminating units	4	
1.3.5	Varnishing units	4	
3	Vehicle refinishing	2,5	(25 + 15) %
4	Coil coating	2,5	(5 + 5) % Existing installations: (10 + 5) %
5.1	Coating of metals and plastics	1,5	>5-10 t/y: (25 + 15) % >10 t/y: (20 + 5) %
5.2	Coating of textiles, fabrics, films and paper	4	>5-10 t/y: (25 + 15) % >10 t/y: (20 + 5) %
7	Coating of wooden surfaces	3 [1)]	>5-25 t/y: (25 + 15) % >25 t/y: (20 + 5) %
9	Wood impregnation	1,5	(40 + 5) %
13	Adhesive coating	3	>5-15 t/y: (25 + 5) % >15 t/y: (20 + 5) %
18.1 – 18.4	Coating of vehicles	2,5	(20 + 5) %
18.5	Coating of track vehicles	1,5	(20 + 5) %
5, 13	Coatings for food industry, aircraft and spacecraft industry	2,33	like Z 5.1, 5.2 or13

[1)] For applications with effectiveness > 85 % or an annual solvent consumption up to 15 t the multiplication factor could be 4

3. The target emission is equal to the annual reference emission multiplied by a percentage equal to
   a) the fugitive emission value + 15, for installations falling within nr. 3 and the lower threshold band of nr. 5 and 7 of Annex 1, and
   b) the fugitive emission value + 5 for all other installations.

4. Compliance is achieved if the actual solvent emission determined from the solvent management plan is less than or equal to the target emission.

Part III: Simplified reduction schemes

1. Compliance is achieved for the target emission laid down in part II if only paints, inks, varnishes, adhesives or auxiliary materials with a solvent content of less than 10 % are used in installations within nr. 1.3 of Annex 1 and the operator of the installation put in an application with an according description of these materials.

2. Compliance is achieved for the target emission laid down in part II if only coating materials with a VOC value of maximum 250 g/l and cleaning materials with a solvent content less than 20 % (mass) are used in small installations (§ 2 Nr. 16)

within nr. 3 or 5.1 of Annex 1 and the operator of the installation put in an application with an according description of these materials.

3. Compliance is achieved for the target emission laid down in part II if only
   a) coating materials with a VOC value of maximum 250 g/l for even and flat surfaces,
   b) coating materials with a VOC value of maximum 450 g/l for other surfaces and
   c) water based stains with a VOC value of maximum 300 g/l

are used in small installations (§ 2 Nr. 16) within nr. 7 of Annex 1 and the operator of the installation put in an application with an according description of these materials.

4. Compliance is achieved for the target emission laid down in part II if only the following products are used in installations within nr. 3 of Annex 1 and the operator of the installation put in an application with an according description of these materials.

Material	VOC value (maximum) [g/l]
Equipment cleaner (e.g. gunwash)	850
Precleaner	200
Bodyfiller/stoppers	250
Wash primer	780
General metal primers	540 [1)]
Surfacer	540 [1)]
Sealers	540 [1)]
Wet to wet filler	540 [2)]
Single layer topcoat	420
Base coatings	420
Clear coatings	420
Special products	840 [3)]

[1)] From 1 January 2010: < 250

[2)] From 1 January 2010: < 420

[3)] The relation of special products to all coatings shall not exceed 10 %.

5. Compliance is achieved for the target emission laid down in part II if in installations within nr. 5.2.1 of Annex 1 the emission factor
   a) for coating and printing of textiles does not exceed 0,8 g C/kg textiles and
   b) from transportation and the remaindered content of the preparation 0,4 g C/kg textiles

and the operator of the installation put in an application with an according description of these materials.

6. Compliance is achieved for the target emission laid down in part II if only adhesives and primers with a solvent content less than 5 % (mass) are used in small installations (§ 2 Nr. 16) within nr. 12 or 13 of Annex 1 and the operator of the installation put in an application with an according description of these materials.

Annex 4: Solvent management plan

This annex is identical to Annex III of the VOC-directive.

Annex 5: Requirements for monitoring, calculation of emissions and calculation of the VOC value

The monitoring requirements are dealt with the chapters "measurement and monitoring". The measurements and reports should be done at the state of the art (e.g. CEN standards, Austrian standards, DIN standards).

Minimum requirements for calculations of emissions:

- Description of activity
- Operating hours of the installation per week (yearly average and maximum)
- Security data sheets of the coating materials, percentage of solvent content, conversion factor for mg solvent to mg C (if unknown: 0,75)
- Annual solvent consumption and solvent management plan
- Report of the measurement of the waste gas volume at the maximum speed of the exhaust system
- Efficiency of the filter system (producer information)
- Calculation of the concentration of solvents and particles in the waste gas at the use the most solvent contenting coating material

Calculation of the content of VOC in coating materials (VOC value):

Coating materials for wooden surface:

$$\text{VOC value} = (100 - \text{nvp} - m_w) \cdot \rho_c \cdot 10$$

ρ_c: density of the coating material (g/cm³)
nvp: non volatile parts of the coating material (%)
m_w: mass of water (%)

For all other coating materials:

$$\text{VOC value} = \frac{\text{mass of volatile parts} - \text{mass of water}}{\text{volume of the coating material} - \text{volume of water}} \quad \text{[gram per litre]}$$

Annex 6 – 8:

Different forms for the report due to the questionaire of the Commission (report of the operator, report of the District Authority, report of the Landeshauptmann).

Further Information:

Homepage of the Ministry for Economic Affairs and Labour:
www.bmwa.gv.at (search: VOC)

For special questions or information:

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Implementation of the VOC-directive in Sweden

Robert Rosenqvist
County Administrative Board Of
Kronoberg County

LÄNSSTYRELSEN
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Summary

- National background – Previous legislation
- Process of implementation
- Result
- Experiences from "the field"
- Personal comments
- Possible alterations
- Conclusions

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Current legislation

- Environmental Code (Parliament)
  - A framework law with general rules – rules for management of land and water, nature conservation, environmental hazardous activities, health protection and so on
- Ordinances (Government)
  - detailed rules
- Regulations (Central authorities e.g. Swedish Environmental Protection Agency, SEPA)

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The Permitting system

- A large number of ***activities*** or operations are ***subject to licensing***
- The ***permit document states the conditions*** under which the activity may be carried out
- ***Conditions*** in the permit document are based on the rules of consideration
- Example: ***emission limit values***

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Permitting organisation

- Permit applications are considered by 5 ***Environmental Courts***
- or Environmental Licensing Delegations at the ***County Administrative boards***
- Notifications are handled by the ***Local Environmental and Public Health Committee***

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Authorisation/Registration Process

- **Threshold value, consumption of 10 tonnes solvent/year**
- **General rules of consideration**
  - **Best possible technology BPT-BAT**
  - **Resource management and ecocykle principles**
  - **Product choice principle**
  - **Appropriate location principle**

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Tools in the Permit/Notification Process

- Environmental quality objects (national, regional and local)
- General Guidelines (Central authorities)
- BREF
- Case Law
- Network for exchange of knowledge and experiences
- Professional organisations

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Implementation Process for the directive

- SEPA produced a proposal and circulated to
  - Other central authorities
  - Regional and local authorities
  - Environmental Courts
  - Some concerned operators
  - Professional organisations

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Result of the implementation

- **A regulation from SEPA - *very similar to the directive***
- Same pollution levels as in the directive but the outline is slightly different from the directive
- 27 articles, in 13 different sections, and 4 annexes
- Provisional regulation

- Incorporation of part of the annex II A into previously existing legislation??

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Handbook/guidelines

- The purpose of the handbook is to help the authorities and the operators
- A proposal has been produced
- The handbook gives explanation of some difficulties
- The handbook also contains guidelines which gives the SEPA:s interpretation of uncertain matters

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Experiences from the "field"

- Most of my colleagues consider that the regulation is too complicated
- Different threshold values for different categories of activities is confusing
- More work at the regional and local authorities with very little or no positive results, we still have to evaluate every activity according to the Environmental Code as well as the VOC-regulation

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My viewpoint on the VOC-rules

+ Presumably positive impact on the total VOC-emission level in some countries
+ General rules can be favourable in some cases
- Different threshold values are confusing
- Different emission limit values for different activities are confusing too
- The rules does not consider the location of the activities

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My viewpoint cont.d

- The allowed pollution levels are often far too high if you apply the rules to medium size or large size activities
- The exception rules is not enough for some cases
- More work for the operators and the authorities – operators as well as civil servants think that the rules are very bureaucratic
- In some cases you get very high pollution levels if you use a reduction scheme

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Example

- Production of doors for kitchen cabinets
- Solvent based paint 670 tonnes/year
- Water based paint 70 tonnes/year
- UV-curing paint 135 tonnes/year

- Maximum allowed VOC-pollution – approx. 670 tonnes/year

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Possible alterations

- Same threshold values for all categories of activities except for those who use extremely harmful compounds
- More possibilities to use some kind of reduction plans e.g. for surface cleaning
- More possibilities for exceptions
- Adjust the multiplication factors in the reduction scheme

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Conclusion

- Maybe it would have been better to implement a national plan!!??
- It is, in most cases, not possible to use only general rules, in order to reduce VOC-emission enough to achieve an acceptable impact level on the local environment

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CASE STUDY: PRINTING

Heatset Web Offset (Heatset Web Lithography)

1. Introduction

Lithography is an **"offset"** printing technique. Ink is not applied directly from the printing plate (or cylinder) to the substrate as it is in gravure, flexography and letterpress. Ink is applied to the printing plate to form the "image" (such as text or artwork to be printed) and then transferred or "offset" to a rubber "blanket". The ink image on the blanket is then transferred to the substrate (typically paper or paperboard) to produce the printing product.

Lithography is based on the principal that oil and water do not mix. Lithographic plates undergo chemical treatment that render the image area of the plate oleophilic (oil-loving) and, therefore, ink-receptive and the non-image area hydrophilic (water-loving). During printing, fountain (dampening) solution, which consists primarily of water with small quantities of isopropyl alcohol and other additives to lower surface tension and control pH, is first applied in a thin layer to the printing plate and migrates to the hydrophilic non-image areas of the printing plate. Ink is then applied to the plate and migrates to the oleophilic image areas. Since the ink and water essentially do not mix, the fountain solution prevents ink from migrating to the non-image areas of the plate.

In **heatset web** lithography, the paper substrate is delivered to the facility in rolls. The paper is fed directly into the press from the roll and is termed a "Web" since it a continuous feed of paper as opposed to individual sheets. After printing, the paper is folded and/or cut "in-line" with the printing units.

Heatset web lithographic **inks** are paste inks that dry evaporating the ink oils contained in the ink. Drying occurs in hot air dryers (normally fueled by natural gas). Many heatset web lithographic presses require a control device (such as a catalytic or thermal oxidizer) to reduce VOC concentrations in the dryer exhaust air stream. VOC emissions also occur from isopropyl alcohol used in the fountain solution and cleanup solvents used to clean ink fountains (trays that hold ink), rollers, blankets, and other press components.

Application: The heatset web lithographic process is used primarily by commercial printers and book publishers. The process is best suited for longer production jobs at high speed (up to 40,000 impressions per hour). Printed products include magazines, periodicals, catalogs, newspaper inserts, tabloids and books.
(*Text by the Institute of Advanced Manufacturing Sciences*)

2. Short description and base data

The installation of this case study consists of 9 printing machines and was authorized before the year 2002. The machines are operated in 7500 hours per year to print newspapers and similar products. VOC are evaporated and emitted in two steps (see figures 1 and 2):

- The waste gas from the printing assemblies is collected by 8 ventilation systems and exhausted directly to the ambient air.
- The waste gas of the drying funnels is fed to 5 emission reduction devices (gas-fired thermal oxidizers) and their exhaust gas is also vented to the ambient air.

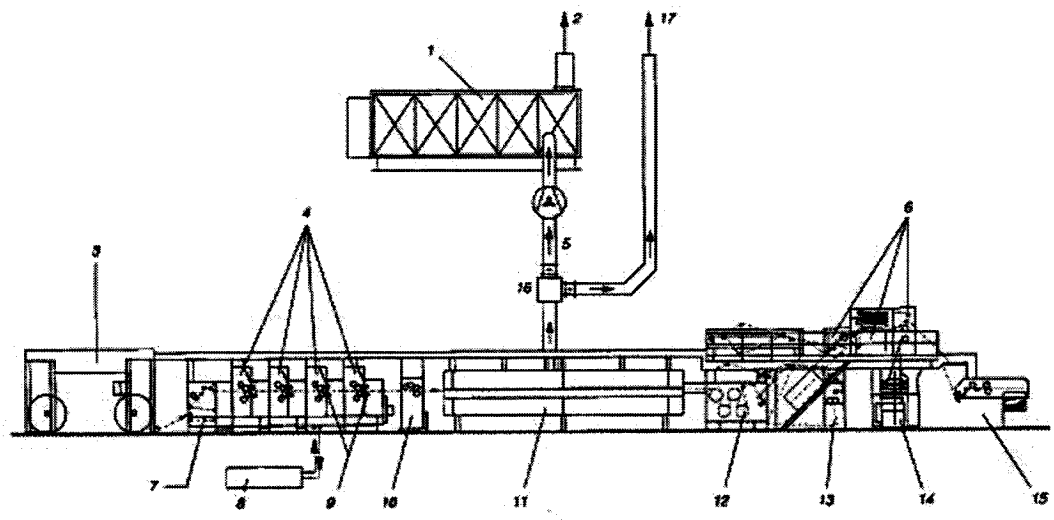


Bild 1. Beispiel für Rollenoffsetdruckanlage
1 Abgasreinigungsanlage
2 Reingas
3 Rollenabwicklung (Rollenwechsler)
4 Druckeinheiten
5 Rohgas
6 Falzapparataufbau
7 Einzugswerk
8 Feuchtmittelaufbereitung
9 Gummituchwascheinrichtung
10 Leimwerk
11 Trockner
12 Kühlwalzenständer
13 Perforierwerk
14 Falzapparat
15 Querschneider
16 Umschaltkappe
17 Anfahrstutzen

Fig. 1. Example of web offset printing plant
1 waste gas cleaning system
2 clean gas
3 paper reel unwinder (reel changer)
4 printing assemblies
5 untreated gas
6 paper folder assembly
7 paper feeder
8 damping solution treatment plant
9 rubber blanket washer
10 gluing unit
11 dryer
12 chill roll frame
13 perforation unit
14 paper folder
15 lateral cutter
16 diversion flap
17 start-up pipe

Figure 1: Scheme of a heatset web offset printing plant (from VDI 2587-1)

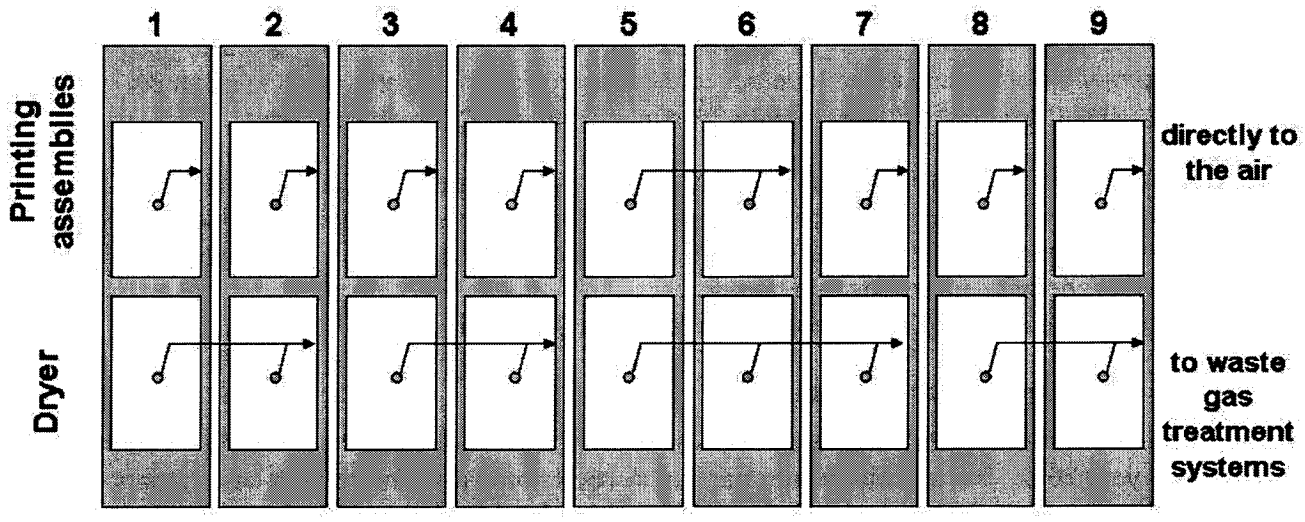


Figure 2: Scheme of the total installation (schematical top view)

3. Input

In the year 2004, 5625 t of ink was used in the process. According to the safety data sheet, the content of heatset oil in the ink is 35% by weight. There were also additional products used containing volatile organic compounds (for the most part isopropanol) in the amount of 126.8 t. There are no VOC recovered for reuse.

4. Output

VOC are emitted, destroyed by thermal oxidation or managed as waste. There are no VOC emissions into waste water, there is no residual in the printed papers (according to the definition in annex IIA of the VOC directive), no VOC containing products are sold and no solvent is recovered for reuse.

4.1 Emissions into air

The ventilation systems of the printing assemblies, also used for room ventilation, are continuously operated in 8700 hours per year. The volume flow of these systems is controlled over the range of 0-24.000 m^3/h in total, depending on ambient temperature conditions. The following data were found representative as a yearly average (concerning the operating hours of the printing machines):

Machine No.	**VOC concentration** [mg/m^3 OC*]	**Volume flow** [m^3/h]	**VOC in total** [kg/a]
1	91.7	2 772	3 177
2	64.3	7 290	5 859
3	123.1	702	1 080
4	118.9	1 971	2 929
5 & 6	55.3	13 500	9 332
7	26.8	4 050	1 357
8	19.1	9 506	2 270
9	16.7	9 685	2 022
Total			28 026

* The carbon content of isopropanol is 60 %.

The second source of VOC emissions is the residual VOC amount in the flue gas of the 5 thermal oxidizers (see data table below).

4.2 Destroyed VOC

According to literature about 40 to 60 % of the heatset oil in the ink evaporates in the drying funnels. These VOC are vented to the thermal oxidizers, which reduce the concentration of organic carbon (OC) to less than 30 mg/m³. The following data were found representative as a yearly average:

Machine No.	VOC conc. untreated [mg/m³ OC*]	Volume flow [m³/h]	VOC in total [kg/a]	
			untreated	clean gas**
1 & 2	3 510	10 000	317 169	2 711
3 & 4	3 475	10 000	314 006	2 711
5, 6 & 7	3 250	12 200	358 283	3 307
8	2 200	8 000	159 036	2 169
9	2 100	8 500	161 295	2 304
Total			1 309 789	13 202

* The carbon content of the heatset oil is about 83 %.
** Maximum value.

4.3 VOC in collected waste

According to the documentation of the company, 2500 kg of waste inks have been handed over to professional waste collectors. The VOC content of the waste is estimated to 10%.

5. VOC flow chart

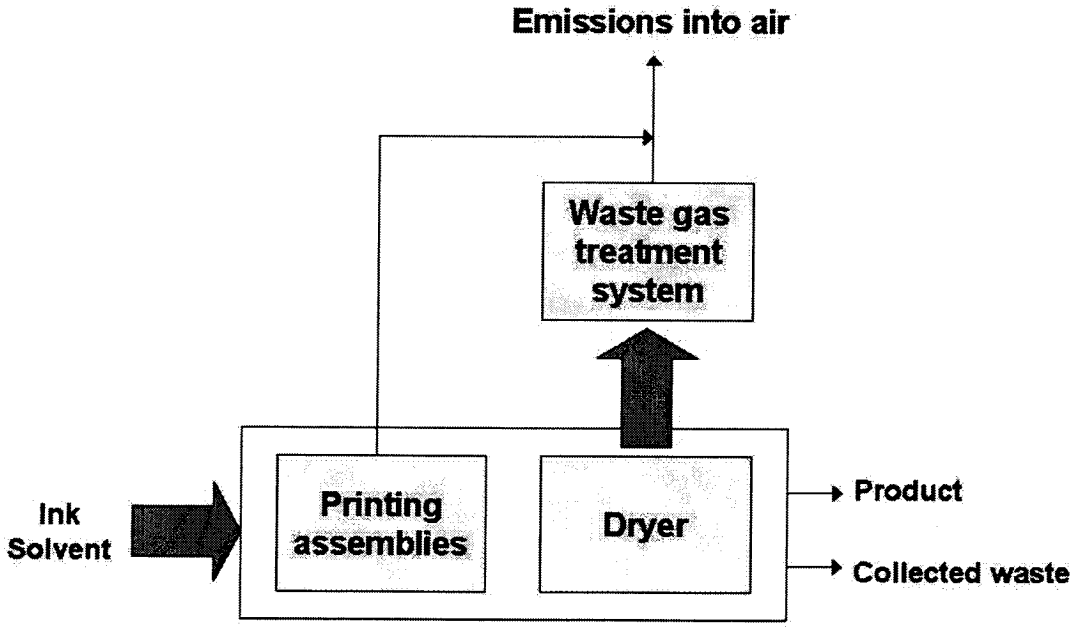


Figure 3: VOC flow chart

6. Draft of the Solvent Management Plan

Mass balance according to annex III of the VOC directive (one possible solution):

Input/ Output	No.	Definition	VOC amount [kg/a]
Input	I/1	The quantity of organic solvents or their quantity in preparations purchased which are used as input into the process in the time frame over which the mass balance is being calculated.	1 338 065
	I/2	The quantity of organic solvents or their quantity in preparations recovered and reused as solvent input into the process.	0
	I	**Inputs of organic solvents**	**1 338 065**
Output	O/1	Emissions in waste gases.	13 202
	O/2	Organic solvents lost in water, if appropriate taking into account waste water treatment when calculating O5.	0
	O/3	The quantity of organic solvents which remains as contamination or residue in products output from the process.	0
	O/4	Uncaptured emissions of organic solvents to air. This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.	28 026
	O/5	Organic solvents and/or organic compounds lost due to chemical or physical reactions (including for example those which are destroyed, e.g. by incineration or other waste gas or waste water treatments, or captured, e.g. by adsorption, as long as they are not counted under O6, O7 or O8).	1 296 587
	O/6	Organic solvents contained in collected waste.	250
	O/7	Organic solvents, or organic solvents contained in preparations, which are sold or are intended to be sold as a commercially valuable product.	0
	O/8	Organic solvents contained in preparations recovered for reuse but not as input into the process, as long as not counted under O7.	0
	O/9	Organic solvents released in other ways.	0
	O	**Outputs of organic solvents**	**1 338 065**
	F	**Fugitive emissions**	**28 026**
	E	**Emissions**	**41 228**

Results of the discussions in the working group "Printing"

The given case study focused on the preparation and completion of a correct Solvent Management Plan (SMP) for a Heatset Web Offset Printing installation.

Discussions on troubles with the Solvent Management Plan

- Unknown (relevant) VOC content of the mineral oils (as part of the heatset ink)
- Definition of VOC difficult to apply, measurement needed (a possible solution could be the replacement of the amount of VOC by the amount of organic carbon)
- Different definitions (e.g. fugitive emissions, not treated waste gases, contained conditions) between the EC directive and the implementations into national law in some member states (e.g. in AT, DE)
- Different interpretation of the definitions in the (member) states leads to different approaches (e.g. installation)
- Given input data are questionable (e.g. the proportion between the solvents used, the VOC content in the collected waste, the amount of collected waste)
- Lack of knowledge about process details
- Poor data availability for authorities, lack of cooperation between authorities and companies
- Other algorithms for calculating the amount of fugitive emissions than by the formula [F = I1 – O1 – O5 – O6 – O7 – O8] is assumed to give much higher errors of calculation (the use of isopropanol results in fugitive emissions of 90%)
- A lot of assumptions are necessary for the development of the SMP, the result is always a compromise
- Base data given are not detailed enough to proof compliance or non-compliance

Discussion on Reduction Schemes

- Use of a Reduction Scheme depends on the requirement for emission reduction devices (e.g. thermal oxidation units)
- Comparison of the figures for permissible emissions of the existing installation and the figures in the Reduction Scheme
- Authority's power to force a company to develop and apply a Reduction Scheme

Conclusions drawn

- ➢ The different approaches and discussions in the different member states and the big variety of VOC installations proof the difficulty of dealing with the EC directive
- ➢ Experiences are just coming up!

Limit Values for new installations for Heatset Web Offset Printing

Member State	VOC Thresholds	Emission Limit Value	Fugitive Limit Value
EC, CY, NL, ...	<15-25 t/a	100 mg/m³ OC	30 %
	>25 t/a	20 mg/m³ OC	30 %
AT, ...	>5-25 t/a	30/75 mg/m³ OC*	30 %
	>25 t/a	20 mg/m³ OC	30 %
SI**	> 0 t/a	registration required	–
	15-25 t/a	20/100 mg/m³ OC*	30 %
	> 25 t/a	20 mg/m³ OC	30 %
...			

* Depending on the abatement technique used, lower values for incineration.

** Emission limit value for treated waste gases only,
30 % limit value includes captured not treated VOCs.

Definition of Fugitive Emissions into air

Member State	Definition includes ...
EC, CY, NL, SI, ...	uncaptured emissions released to the outside environment via windows, doors, vents and similar openings [Art. 2 (10)]
AT, ...	uncaptured emissions released to the outside environment via windows, doors, vents and similar openings as well as room ventilation systems
...	

Definition of Contained Conditions

Member State	Definition includes ...
EC, AT, CY, SI, ...	VOCs released ... either via a stack or abatement equipment [Art. 2 (30)]
...	VOCs released ... via an abatement equipment
NL	no specific definition for contained conditions
...	

Monitoring:

In **AT** the operator of the plant (company) has to prove the compliance concerning emission limit values (ELV), etc.

- for the first time at the start of operation
- and then at intervals of three years

by measurements of organic carbon (OC), additionally of NO_X and CO in the case of afterburning, by experts in accordance with Annex 5 to the national regulation (except in the case of continuous measurements).
In plants (companies), in which the annual solvent consumption does not exceed 2 t, in place of these measurements also a calculation of the emission concentration in accordance with annex 5 is allowed.

If the mass flow of VOC in the exhaust gas of a VOC installation exceeds 10 kg/h (calculated as OC), the installation has to be equipped with suitable continuous measuring instruments. Continuous measurements are not necessary, if it is guaranteed by another suitable continuous monitoring (e.g. temperature in the case of catalytic afterburning) or by suitable primary measures that the ELV for exhaust gases are kept. The suitability must be proven by an expert's appraisal.

Once a year the operator must provide a SMP by an expert or by himself, if he possesses the technical knowledge and experiences necessary for the development of the SMP and his past activity guarantees also a conscientious operation.
The operator must convey a copy of the SMP to the authority within three months of the end of the calendar year. The original of the SMP must to be kept at least three years in the company.

Once a year the operator must prove the compliance with

- limit values for the fugitive emissions
- limit values for the total emission
- requirements for the Reduction Scheme

on the basis of a SMP by an experts appraisal.

Reporting

In **AT** beginning in 2005 and afterwards at intervals of three years:

- Report by the operator to the competent authority (district authority) using a form, which is part of the national regulation
- Summarising report by the competent authority to the head of the province (governor)
- Summarising report by the governor to the federal ministry
- Summarising report by the federal ministry (via the Umweltbundesamt Wien – Environmental Protection Agency Vienna) to the EC

Case study: coating of wood

Situation:

- One operator
- Coating in two installations:
  - Annual solvent consumption: 24.000 kg
  - No VOC exhaust gas abatement technique

Pre-treatment → Top-coating → Clear-coating

IMPEL workshop on VOC:
German point of view to the case study "coating of wood"

Dr. Richard Schlachta
Bavarian Agency for Environment
Salzburg, 21.-23.09.2005

1

Case study: coating of wood

Requirements:

1. Step:

Is a permitting license necessary for the installation?

↓

Yes, solvent consumption > 15 t/a
(Nr. 5.1 column 2 of Annex of 4. BImSchV):

IMPEL workshop on VOC:
German point of view to the case study "coating of wood"

Dr. Richard Schlachta
Bavarian Agency for Environment
Salzburg, 21.-23.09.2005

2

Case study: coating of wood

2. Step: Activities according to German VOC Directive (31. BImSchV)? ⟷ Yes.

No. 9.2 of Annex II: Wood coating

↓

3. Step: Does the activity fall under the scope of 31. BImSchV because of the solvent consumption? ⟷ Yes; solvent consumption >> threshold of 5 t/a

-> Installation No. 9.2 of Annex I

Remark:

- Cleaning of equipment is considered to the activity in each case, here No. 9.2

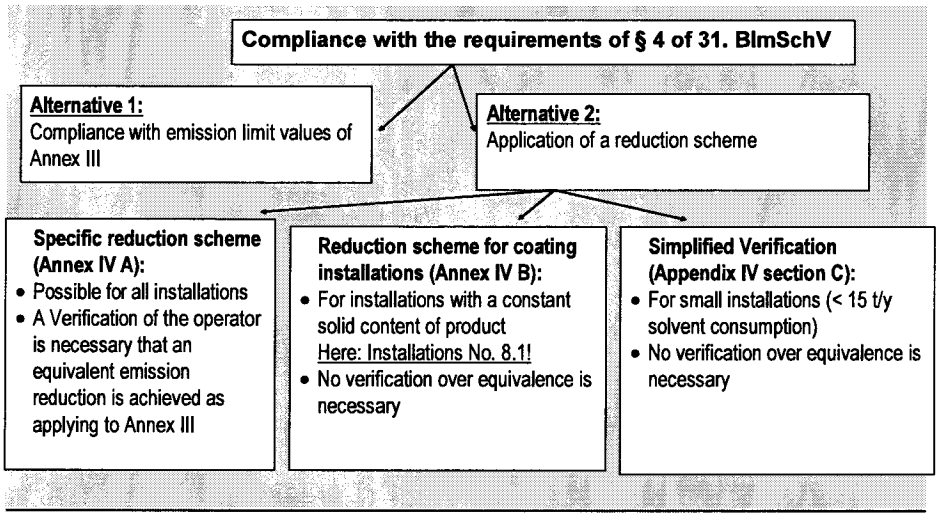
Case study: coating of wood

Requirements according Annex III Nr. 9.2 of 31. BImSchV:

Threshold [t/year]	Emission limit value waste gas [mg C/m³]	Emission limit value fugitive emission [% of solvent input]	Special provisions
> 15 - 25 > 25	100 (1) 50 (1); 20 (2)	25 (3) 20 (3)	3) VOC in captured untreated exhaust gas = fugitive emission

1) For coating and drying
2) In case of application of incineration units as abatement technique

Case study: coating of wood



Case study: coating of wood

Motivation for using a reduction scheme: „Captured untreated" exhaust gases are considered as fugitive emissions at different activities

Differentiation within O1 = Emission in waste gases

O1.1 = captured cleaned (treated) waste gas

O1.2 = captured not cleaned (untreated) waste gas

For certain installations:

O1.2 is considered as fugitive emission!

-> Problem with „dilution or cooling" with air is left out

-> Numerous installations without exhaust gas abatement technique will choose the reduction scheme = compliance of 31. BImSchV through primarily measurements (avoidance of VOC emissions)

Case study: coating of wood

Reduction scheme = Annex IV of 31. BImSchV

- Measurements of VOC reduction taken before entry into force of the 31. BImSchV are not taken into account when using a reduction scheme
- **Coating installations:** -> The reduction scheme for coating installations is the more concrete instruction and has to be used preferably instead of an installation specific reduction scheme!
- An installation specific reduction scheme is preferably applicable for activities not listed under Annex IV B

Case study: coating of wood

Specific (individual) reduction scheme (all installations) = Annex IV A

Verification of the operator is necessary that an equivalent emission reduction is achieved as the emissions limit values according to Annex III would complied

Possible usage of a specific reduction scheme:

E.g. where a compensation of the emission freights of the captured waste gas and fugitive emissions is possible:
The plus of emission of the one kind of emission will be compensated by an equivalent minus of the other kind of emission – the total emission complies to the Annex III

Case study: coating of wood

Reduction scheme for coating installations according to Annex IV B:

Aim: Emission reduction by primary measures avoiding an exhaust gas abatement technique!

- Reduction of the total emission of an installation by decreasing the average solvent content of the total input and/or increased efficiency in the use of solids
- A verification of equivalence to Annex III is not necessary; the calculated target emission must be complied!
- Determination of the total mass of solids in the annual quantity of coating materials

Case study: coating of wood

- Calculation of the annual reference emission = Total mass of solids * multiplication factor (= table under No. 2 of section B)
- Calculation of the target emission = reference emission * percentage (depending from installation type, out of table under No. 2 of section B)
- Compliance is achieved if actual solvent emission determined from solvent management plan is ≤ target emission
- Annual new calculation of the reference emission and the target emission; depending from solvent consumption and content of solids fluctuating magnitudes

Case study: coating of wood

What does the reference emission present?

- Fictitious total emission if conventional solvent borne coatings are applied
- Amount of emitted solvent in relation to mass of solids applying conventional solvent borne coating materials

How is the target emission calculated? Percentage?

- Fictitious assumption of an exhaust gas abatement unit: The VOC emissions are almost completely captured and led to the abatement unit
- Only a small amount of fugitive emissions as well as the VOC in cleaned waste gas are remaining = „Percentage"
- Percentage = „emission limit" for fugitive emissions according to Annex III + emissions of residual VOC in the waste gas of the abatement unit (assumed as 5 or 15% of solvent input)

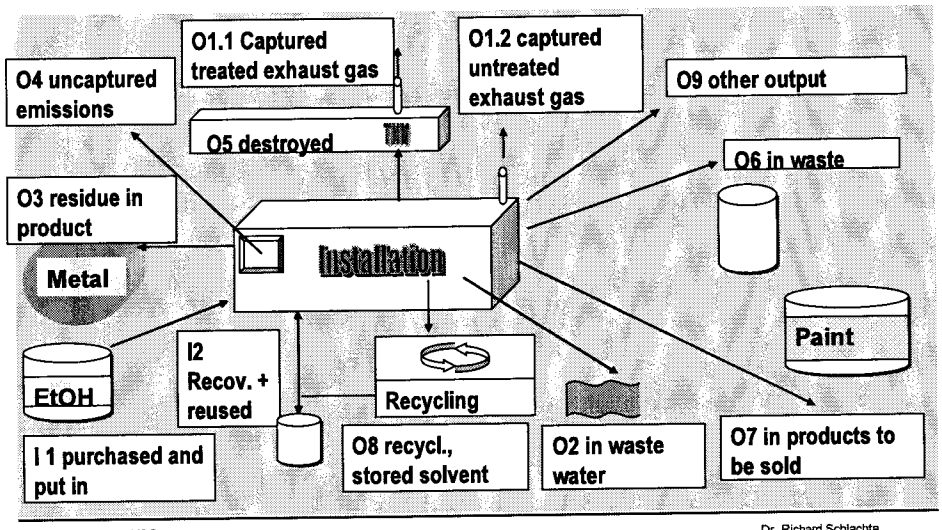
Case study: coating of wood

Reduction scheme section B, Annex IV, installations No. 9.2

Solvent consumption [t/a]	Multiplication factor for calculating the reference emissions	Percentage for calculation of the target emissions
Other coating		
> 5 – 15	4	(25 + 15)%
> 15 – 25	3 (1)	(25 + 15)%
> 25	3 (1)	(20 + 5)%

1 = For application techniques exceeding an efficiency of >85% a multiplication factor of 4 can be accepted

Case study: coating of wood



Case study: coating of wood

Case study: Coating of wood

- 2-layer-application: clear-coat + top-coat
- No exhaust abatement technique
- Assumption: solvents will be emitted completely out of the coating
- The installation falls into the scope of the 31. BImSchV because exceeding solvent consumption threshold

Material	*Consumption [kg]*	*VOC-content [%]*	*[kg]*	*Content solids [%]*	*[kg]*
Manual operated cleaning	3000	100	3.000	0	0
Clear-coat	20.000	80	16.000	20	4.000
Top-coat	10.000	50	5.000	50	5.000
Total			*24.000*		*9.000*

Case study: coating of wood

Solvent management plan:

I1	Purchased solvent and put in	24.000 kg
I2	Recovered and reused solvent in the installation	2.000 (solvent recovery)?
O1.1	Captured treated waste gas emissions	0 (air of the hall = fugitive emission)
O1.2	Captured untreated waste gas emissions	0 (air of the hall = fugitive emission)
O2	Solvent in waste water	Here neglected
O3	Solvent in product	Here neglected
O4	Uncaptured emissions	Calculation

Case study: coating of wood

Solvent management plan:

O5	Destroyed solvent by an exhaust gas abatement unit	Not applicable, because no abatement unit for waste gas or waste water
O6	Solvent in waste	3.200 kg/a
O7	Solvent in products to be sold	Not applicable
O8	Recovered solvent but not as input into the process	Not applicable
O9	Solvent released in other ways	2.000 ?

Case study: coating of wood

Determination of the solvent consumption:

LV = I1 – O8 = 24.000 kg – 0 kg = 24.000 kg

-> Installation Nr. 8.1 of Annex I of 31. BImSchV

Calculation of the fugitive emissions according Annex V Nr. 2.2.1 b:

F = I1- O1.1 – O5 – O6 – O7 – O8 = 24.000 kg – 0 – 0 – 3.200 kg/a – 0 - 0 = 20.800 kg/a

Calculation of the total emissions according Annex V Nr. 2.1.2 b):

E = F + O1.1 = 20.800 kg/a + 0 = 20.800 kg/a

Case study: coating of wood

Alternatives: Installation of an exhaust gas abatement unit or using a reduction scheme

Reduction scheme according to Annex IV section B:

Reference emissions: 9.000 kg solids/year * 3 (Multiplication factor) = 27.000 kg/year

Target emission = Reference emission * percentage = 27.000 kg/year * (25 + 15)% = 10.800 kg/year

Following total emissions may not be exceeded:

- from 01.11.2005: Target emission * 1,5 = 16.200 kg/year
- from 01.11.2007: Target emission = 10.800 kg/year

Result:

Emission reduction measures are necessary to comply to the target emission! In comparison: current total emissions 20.800 kg/year!

Case study: coating of wood

„Simplified Verification" = Section C Annex IV 31. BImSchV

- Input of coatings with limited VOC contend value:
  The best and cheapest way to comply with the requirements of the 31. BImSchV
- Lowest effort for operators and authorities
- No annual solvent mass balance necessary
- No verification necessary
- Usage limited to small installations where no authorisation is necessary

Case study: coating of wood

- Qualified operational documentation necessary over type and quantity of inputs with VOC content value; deposition of these documents near the installation at least 5 years
- The VOC content limits relate to the individual useable coating material (no sum parameter or average over all coating materials)

Case study: coating of wood

Simplified verification for installations No 9.1 "coating of wood with solvent consumption < 15 t/year":

a) Coating of plane parts: Exclusive coatings with a VOC content value ≤ 250 g/l,

b) Coating of other surfaces: Exclusive coating with a VOC content value ≤ 450 g/l

and

c) Exclusive water based woodstains with a VOC content value ≤ 300 g/l

Case study: coating of wood

Substitution of a solvent borne woodstain by a water based woodstain:

VOC content solvent borne woodstain:

Content of solids 5 weight% (= non-fugitive parts nfa), part of solvent 95 weight%, density (ρ_s): 0,9 g/cm^3, part of the mass of water in % (m_w): 0

VOC value (g/l) = $(100 - nfa - m_w)*\rho_s*10 = (100 - 5 - 0)*0{,}9*10 =$ 855 g/l

VOC content water borne woodstain:

Content of solids 5 weight% (= non-fugitive parts nfa), parts of solvent 25 weight%, density (ρ_s): 1,0 g/cm^3, content of water in % (m_w): 70

VOC value (g/l) = $(100 - nfa - m_w)*\rho_s*10 = (100 - 5 - 70)*1{,}0*10 =$ 250 g/l

Case study: coating of wood

In Germany: Application of reduction schemes at installations needing an authorisation: The principle of precaution has to be considered (§ 4 sentence 3 of 31. BImSchV):

- The reduction scheme regulates only the max. annual total emission fright.
  -> But: Harmful effects on environment are possible by higher actual emission mass concentrations or mass flows although the installation complies to the reduction scheme (e.g. by relevant odours)
- Therefore:
  Additionally to the reduction scheme:-> fixation of emission limits for captured waste gas sources of installations needing an authorisation!

Case study: coating of wood

Roles of the licensing authority and the operator in case of application of a reduction scheme

A) Existing installation:

1. Step authority:

Information and consultation of the operator, e.g. by meeting →

Operator:

- Verification if the installation falls under the scope of 31. BImSchV:
- Determination of the activities with amount of solvent consumption
- Registration of the activities at the authority

Case study: coating of wood

3. Step **Authority:**

- Acquisition and control of the registration or obligation for licensing; if necessary demand on further documents and more intense consultation of the operators e.g. by meetings
- Legal acceptation of the registration: Confirmation writing to the operator, if necessary request to carry out a licensing procedure

Operator:

- Internal control by the operator how the requirements can be complied
- Decision on a reduction scheme Annex IV or the emission limit values Annex III
- Line-up a reduction scheme

Case study: coating of wood

3. Step: **Authority:**

- Technical verification of the reduction scheme (e.g. in authorization procedure)
- Binding acceptation of the reduction scheme by the authority
- In cases of installations needing an authorization:

  Fixation of the requirements of the 31. BImSchV with respect to the reduction scheme in the authorization

Case study: coating of wood

New installations/substantial change/installation without need of authorisation:

- In case of small installations without need of authorisation: Acceptation of the reduction scheme by the authority in advance before the installation being put into operation
- Legal fixation of realisation of the reduction scheme before the installation being put into operation („notification")
- Fixation of the requirements relating to the 31. BImSchV under consideration of the reduction scheme in the authorisation of an installation

Case study: coating of wood

Obligation of a reduction scheme

- The reduction scheme presented by the operator is legally binding.
- The binding declaration of the operator is necessary for all types of reduction schemes for existing and new installations; a legally acceptation by the authority is in every case necessary.
- If a reduction scheme doesn't comply to the requirements of the 31. BImSchV the authority claims corrections.
- If no plausible reduction scheme was presented by the operator the installation has to comply to the requirements of Annex III of the 31. BImSchV until latest 31.10.2007!

Case study: coating of wood

- Changes on the reduction scheme are only permitted if the authority was informed and has accepted the changes previously
- Deposition of a copy of the reduction scheme at operating location
- The reduction scheme must be based on realistic technical premises
- Where substitutes containing little or no solvent are still under development a time extension can be given to the operator to implement his emission reduction plans

Working Group
Pharmaceutical Industry

Working Group Pharmaceutical Industry

PLASMA- FRACTIONATION

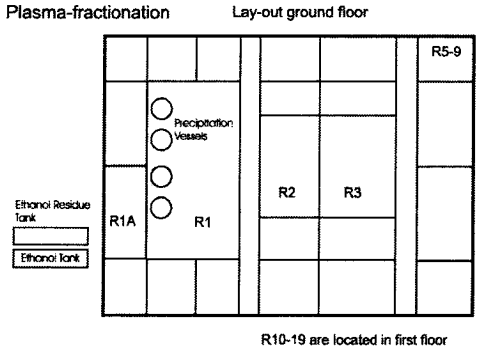
The working group compiled a solvent management plan on the basis of data submitted by the operator. Regional differences in the interpretation were discussed.

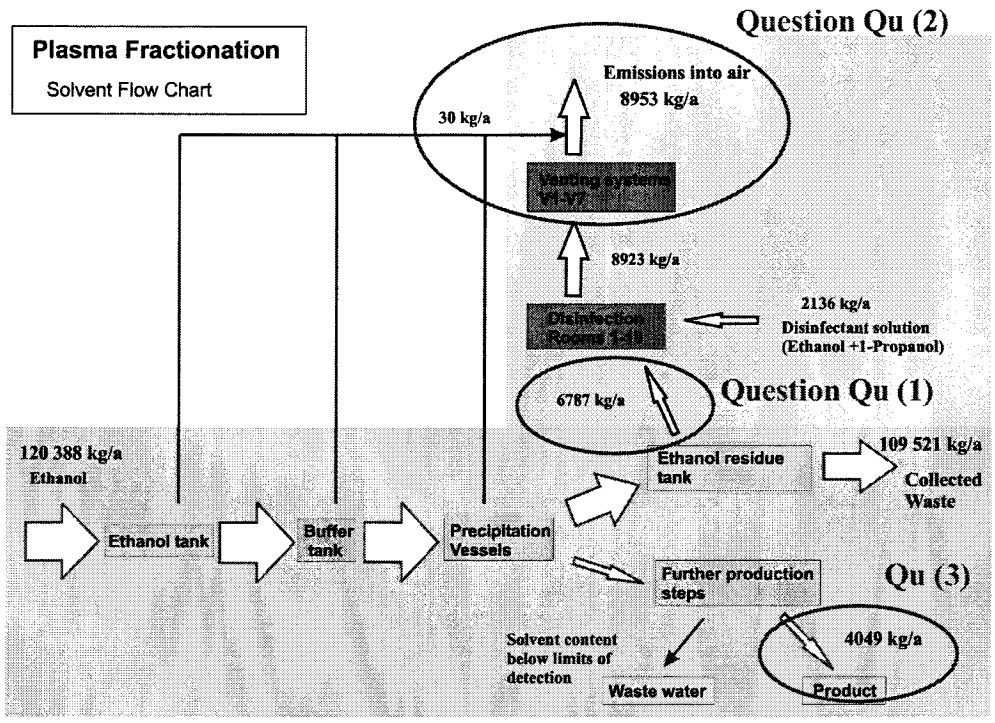
Short description of the installation:

Blood- plasma can be divided in different fractions by **ethanol- precipitation**. Plasma proteins such as albumin can thus be obtained in concentrated form.

The relevant parts of the installation are: **the ethanol tank, four precipitation vessels and the tank used for ethanol residues**.

due to the strict health regulations a significant amount of alcohol preparations (ethanol + 1-propanol resp. pure ethanol) have to be used for disinfection.





Solvent Management Plan Qu (1): Input

Question (1):

~ 6000 kg /a of ethanol residue from the precipitation process are used for cleaning.

=> Shall we take these 6000 kg/a into account as I/2 ??

*(I/2: The quantity of **organic solvents** or their quantity in preparations **recovered and reused** as solvent input into the process)*

No, because this may be regarded as „further use", not as a „reuse" in the meaning of the directive

Solvent Management Plan Qu (1): Input

I/1	The quantity of organic solvents or their quantity in preparations purchased which are used as **input into the process** in the time frame over which the mass balance is being calculated.	**122 524 kg/a**
I/2	The quantity of **organic solvents** or their quantity in preparations **recovered and reused** as solvent input into the process. (The recycled solvent is counted every time it is used to carry out the activity.)	**0**
I	**Inputs of organic solvents**	**122 524 kg/a**

Solvent Management Plan Qu (2): output O/1; O/4

Question (2): Emissions into air

a) Emissions at transfilling (vessel breathing):

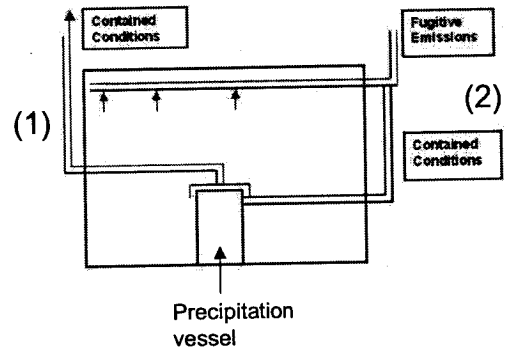
- ventilation pure alcohol tank
- ventilation buffer tank ~30kg/a
- ventilation vessel/ precipitation
- ventilation vessel/ flushing
- ventilation alcohol residue tank

b) Emissions through room ventilation systems (disinfection agent) ~9000 kg/a

=> Definition of fugitive emissions in this case?

Solvent Management Plan Qu (2): output O/1; O/4

Possible technical solutions:



(1) VOC from vessel breathing leave through seperate stack

(2) VOC from vessel breathing are emitted through the same stack as VOC from room cleaning

Case (2) was chosen in this installation

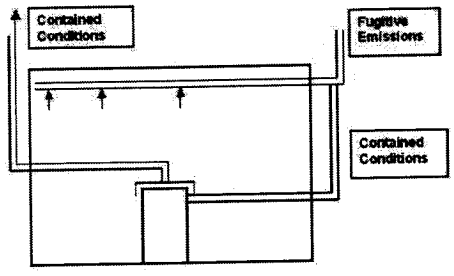
Solvent Management Plan Qu (2): output O/1; O/4

Different interpretation of „fugitive emissions" and „contained conditions"

Directive: contained conditions shall mean conditions under which an installation is operated such that the VOCs released from the activity are collected and discharged in a controlled way either via a stack or abatement equipment and are therefore not entirely fugitive;

Directive: fugitive emissions shall mean any emissions *not* in waste gases of volatile organic compounds into air.... They include **uncaptured emissions released to the outside environment via windows, doors, vents and similar openings;**

e.g. A, Cz, F, S, Slo : different interpretation, so that emissions through room ventilation are regarded as fugitive.



Solvent Management Plan Qu (2): output O/1; O/4

=> therefore:

Council directive:
all VOC emissions into air are regarded as contained (O/4)

Different interpretation (eg. A, Cz,F, S, Slo):
VOC emissions from vessel breathing are regarded as contained (O/1), whereas emissions from room cleaning are regarded as fugitive (O/4) although they leave through the same stack !!

=> Possible consequences for compliance with the limit value of fugitive emissions!

Qu (3): 4000 kg/a ethanol in the product, O/3 or O/7?

O/3	The quantity of organic solvents which remains as **contamination or residue in products** output from the process.	**4049 kg/a**
O/7	Organic solvents, or **organic solvents contained in preparations**, which are **sold** or are intended to be sold as a commercially valuable product.	**(4049 kg/a)**

Both points seem to be possible in this case. Better knowledge is required if the solvent is essential for the product and if it may evaporate from the product in later uses.

=> Possible consequences for compliance with the limit value of fugitive emissions!

The working group tends to regard the solvent content as contamination

Solvent Management Plan, summary „output"

O/1	**Emissions in waste gases**	**Direct.: 8953 A, Cz, F, S, Slo: 30**
O/2	**Organic solvents lost in water**, if appropriate taking into account waste water treatment when calculating O5	**0**
O/3	The quantity of organic solvents which remains as **contamination or residue in products** output from the process.	**4049**
O/4	**Uncaptured emissions of organic solvents to air.** This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.	**Directive: 0** **A, Cz, F, S, Slo: 8923**

Solvent Management Plan, summary „output"

O/5	Organic solvents and/or organic compounds **lost due to chemical or physical reactions** (including for example those which are destroyed, e.g. by incineration or other waste gas or waste water treatments, or captured, e.g. by adsorption, as long as they are not counted under O6, O7 orO8).	**0**
O/6	Organic solvents contained in **collected waste**.	**109 521**
O/7	Organic solvents, or **organic solvents contained in preparations**, which are **sold** or are intended to be sold as a commercially valuable product.	**0**
O/8	Organic solvents **contained in preparations recovered for reuse but not as input** into the process, as long as not counted under O7.	**0**
O/9	Organic solvents **released in other ways**	**0**
O	**Outputs of organic solvents**	**122 523**

Solvent Management Plan Summary

I	**Inputs of organic solvents**	**122524**
O	**Outputs of organic solvents**	**122 523**
F	**Fugitive emissions**	**Direct.: 4049 (3,3%)** A, Cz, S, Slo **12972 (10,6%)** **F = 8923***
E	**Emissions**	**13002 (10,6%)**

* F: O2 + O3 + O4 + O9, France: F: O2 + O4 + O9

Fugitive/total emission values (percentage of solvent input): 5% (new inst.)!!

Moreover, emission limits are exceeded (78 mg/m³, limit: 20 mg/m³)

=> therefore: non compliance with regulation

Limit Values for new installations

	tresholds	ELV	fugitive ELV	TELV
directive	> 50 t/a	20 mg C/Nm³ (150)*	5% of solvent input	5% of solvent input
A	> 10 t/a	20 (100)*	5%	5%
F	> 50t/a < 50t/a and flow >2kg/h	20 (150)* 110	5% fixed by autorisation	
Slo	> 50 t/a	20 (150)*	5%	5%

*if techniques are used which allow reuse of recovered solvent

What can be done to avoid non-compliance ?

1. Dilution: No!
   The dilution of the waste-gas to comply with the emission-limits is not allowed, moreover it has no influence on *the amount* of emissions.

2. Abatement - system:
   Active carbon
   Bioreactor
   Combustion

   These solutions fight economic and technical difficulties because of the low VOC- load of the waste gas.

3. Change of the cleaning agent (disinfectant soap!)

   A change of the cleaning agent is regarded as the best solution.

IPPC

Question:

Is this installation an IPPC-plant ?

Answer:

No, because the IPPC directive defines:
„Installations using a chemical or biological process…"

In this case study the installation uses a physical process only !

Working Group
Surface Cleaning

VOC – Directive

Council Directive 1999/13/EC

I

(Acts whose publication is obligatory)

COUNCIL DIRECTIVE 1999/13/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

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130s(1) thereof,

Having regard to the proposal from the Commission [1],

Having regard to the opinion of the Economic and Social Committee [2],

Acting in accordance with the procedure laid down in Article 189c of the Treaty [3],

(1) Whereas the European Community action programme on the environment approved by the Council and the representatives of the Governments of the Member States meeting within the Council by resolutions of 22 November 1973 [4], 17 May 1977 [5], 7 February 1983 [6], 19 October 1987 [7] and 1 February 1993 [8] stresses the importance of the prevention and reduction of air pollution;

(2) Whereas in particular the resolution of 19 October 1987 emphasises the importance of Community action to concentrate, *inter alia*, on implementation of appropriate standards in order to ensure a high level of public health and environmental protection;

(3) Whereas the European Community and its Member States are parties to the Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution concerning the control of emissions of volatile organic compounds in order to reduce their transboundary fluxes and the fluxes of the resulting secondary photochemical oxidant products so as to protect human health and the environment from adverse effects;

(4) Whereas pollution due to volatile organic compounds in one Member State often influences the air and water of other Member States; whereas, in accordance with Article 130r of the Treaty, action at Community level is necessary;

(5) Whereas, because of their characteristics, the use of organic solvents in certain activities and installations gives rise to emissions of organic compounds into the air which can be harmful for public health and/or contributes to the local and transboundary formation of photochemical oxidants in the boundary layer of the troposphere which cause damage to natural resources of vital environmental and economic importance and, under certain exposure conditions, has harmful effects on human health;

(6) Whereas the high incidence of high tropospheric ozone concentrations in recent years has triggered

(1) OJ C 99, 26.3.1997, p. 32.
(2) OJ C 287, 22.9.1997, p. 55.
(3) Opinion of the European Parliament of 14 January 1998 (OJ C 34, 2.2.1998, p. 75), Council Common Position of 16 June 1998 (OJ C 248, 7.8.1998, p. 1) and Decision of the European Parliament of 21 October 1998 (OJ C 341, 9.11.1998, p. 70).
(4) OJ C 112, 20.12.1973, p. 1.
(5) OJ C 139, 13.6.1977, p. 1.
(6) OJ C 46, 17.2.1983, p. 1.
(7) OJ C 328, 7.12.1987, p. 1.
(8) OJ C 138, 1.2.1993, p. 1.

widespread concern regarding the impact on public health and the environment;

(7) Whereas, therefore, preventive action is required to protect public health and the environment against the consequences of particularly harmful emissions from the use of organic solvents and to guarantee citizens the right to a clean and healthy environment;

(8) Whereas emissions of organic compounds can be avoided or reduced in many activities and installations because potentially less harmful substitutes are available or will become available within the coming years; whereas, where appropriate substitutes are not available, other technical measures should be taken to reduce emissions into the environment as much as economically and technically feasible;

(9) Whereas 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) Whereas installations and processes which fall under this Directive should at least be registered if they are not subject to authorisation under Community or national legislation;

(11) Whereas existing installations and activities should, where appropriate, be adapted so that within an appropriate period they meet the requirements established for new installations and activities; whereas that period should be consistent with the timetable for compliance of Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control [1];

(12) Whereas the relevant parts of existing installations which undergo substantial change must, as a matter of principle, meet the new installation standards for the substantially changed equipment;

(13) Whereas organic solvents are used by many different types of installations and activities so that, in addition to general requirements, specific requirements should be defined and, at the same time, thresholds for the size of the installations or activities which have to comply with this Directive;

(14) Whereas a high level of environmental protection requires the setting and achievement of emission limits for organic compounds and appropriate operating conditions, in accordance with the principle of best available techniques, for certain installations and activities using organic solvents within the Community;

(15) Whereas in some cases Member States may exempt operators from complying with the emission limit values because other measures, such as the use of low-solvent or solvent-free products or techniques, provide alternative means of achieving equivalent emission reductions;

(16) Whereas emission-limiting measures adopted before the entry into force of this Directive should be taken into account in an appropriate way;

(17) Whereas alternative approaches to reduction may allow the objectives of this Directive to be achieved more effectively than by implementing uniform emission limit values; whereas, therefore, Member States may exempt existing installations from compliance with the emission limits if they implement a national plan, which will, within the timetable for implementation of this Directive, lead to an at least equal reduction in emissions of organic compounds from these activities and installations;

(18) Whereas existing installations falling under Directive 96/61/EC which are covered by a national plan can under no circumstances be exempted from the provisions of that Directive, including Article 9(4) thereof;

(19) Whereas in many cases small and medium-sized, new and existing installations may be allowed to comply with somewhat less stringent requirements to maintain their competitiveness;

(20) Whereas for dry cleaning a zero threshold is appropriate, subject to specified exemptions;

(21) Whereas monitoring of emissions is required, including the application of measurement techniques, to assess the mass concentrations or the quantity of the pollutants whose release into the environment is permitted;

(22) Whereas operators should reduce emissions of organic solvents, including fugitive emissions, and of organic compounds; whereas a solvent management plan is an important tool to verify this; whereas, although guidance may be given, the solvent management plan is not developed to the stage where a Community methodology can be established;

(23) Whereas Member States have to establish a procedure to be followed and measures to be taken where emission limitations are exceeded;

[1] OJ L 257, 10.10.1996, p. 26.

(24) Whereas the Commission and the Member States should collaborate in order to ensure that information on the implementation of this Directive and on the progress of substitution options is exchanged,

HAS ADOPTED THIS DIRECTIVE:

Article 1

Purpose and scope

The purpose of this Directive is to prevent or reduce the direct and indirect effects of emissions of volatile organic compounds 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 thresholds listed in Annex IIA.

Article 2

Definitions

For the purposes of this Directive:

1. *installation* shall mean a stationary technical unit where one or more activities falling within the scope defined in Article 1 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;

2. *existing installation* shall mean an installation in operation or, in accordance with legislation existing before the date on which this Directive is brought into effect, an installation which is authorised or registered or, in the view of the competent authority, the subject of a full request for authorisation, provided that the installation is put into operation no later than one year after the date on which this Directive is brought into effect;

3. *small installation* shall mean an installation which falls within the lower threshold band of items 1, 3, 4, 5, 8, 10, 13, 16 or 17 of Annex IIA or for the other activities of Annex IIA which have a solvent consumption of less than 10 tonnes/year;

4. *substantial change*

   — for an installation falling within the scope of Directive 96/61/EC, shall have the definition specified in that Directive,

   — for a small installation, shall mean a change of the nominal capacity leading to an increase of emissions of volatile organic compounds of more than 25 %. Any change that may have, in the opinion of the competent authority, significant negative effects on human health or the environment is also a substantial change,

   — for all other installations, shall mean a change of the nominal capacity leading to an increase of emissions of volatile organic compounds of more than 10 %. Any change that may have, in the opinion of the competent authority, significant negative effects on human health or the environment is also a substantial change;

5. *competent authority* shall mean the authority or authorities or bodies responsible under the legal provisions of the Member States for carrying out the obligations arising from this Directive;

6. *operator* shall mean any natural or legal person who operates or controls the installation or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of the installation has been delegated;

7. *authorisation* shall mean a written decision by which the competent authority grants permission to operate all or part of an installation;

8. *registration* shall mean a procedure, specified in a legal act, involving at least notification to the competent authority by the operator of the intention to operate an installation or activity falling within the scope of this Directive;

9. *emission* shall mean any discharge of volatile organic compounds from an installation into the environment;

10. *fugitive emissions* shall mean any emissions not in waste gases of volatile organic compounds into air, soil and water as well as, unless otherwise stated in Annex IIA, solvents contained in any products. They include uncaptured emissions released to the outside environment via windows, doors, vents and similar openings;

11. *waste gases* shall mean the final gaseous discharge containing volatile organic compounds or other pollutants, from a stack or abatement equipment into air. The volumetric flow rates shall be expressed in m^3/h at standard conditions;

12. *total emissions* shall mean the sum of fugitive emissions and emissions in waste gases;

13. *emission limit value* shall mean the mass of volatile organic compounds, expressed in terms of certain specific parameters, concentration, percentage and/or level of an emission, calculated at standard conditions, N, which may not be exceeded during one or more periods of time;

14. *substances* shall mean any chemical element and its compounds, as they occur in the natural state or as produced by industry, whether in solid or liquid or gaseous form;

15. *preparation* shall mean mixtures or solutions composed of two or more substances;

16. *organic compound* shall mean any compound containing at least the element carbon and one or more of hydrogen, halogens, oxygen, sulphur, phosphorus, silicon or nitrogen, with the exception of carbon oxides and inorganic carbonates and bicarbonates;

17. *volatile organic compound (VOC)* shall mean any organic compound having at 293,15 K a vapour pressure of 0,01 kPa or more, or having a corresponding volatility under the particular conditions of use. For the purpose of this Directive, the fraction of creosote which exceeds this value of vapour pressure at 293,15 K shall be considered as a VOC;

18. *organic solvent* shall mean any VOC which is used alone or in combination with other agents, and without undergoing a chemical change, to dissolve raw materials, products or waste materials, or is used as a cleaning agent to dissolve contaminants, or as a dissolver, or as a dispersion medium, or as a viscosity adjuster, or as a surface tension adjuster, or a plasticiser, or as a preservative;

19. *halogenated organic solvent* shall mean an organic solvent which contains at least one atom of bromine, chlorine, fluorine or iodine per molecule;

20. *coating* shall mean any preparation, including all the organic solvents or preparations containing organic solvents necessary for its proper application, which is used to provide a decorative, protective or other functional effect on a surface;

21. *adhesive* shall mean any preparation, including all the organic solvents or preparations containing organic solvents necessary for its proper application, which is used to adhere separate parts of a product;

22. *ink* shall mean a preparation, including all the organic solvents or preparations containing organic solvents necessary for its proper application, which is used in a printing activity to impress text or images on to a surface;

23. *varnish* shall mean a transparent coating;

24. *consumption* shall mean the total input of organic solvents into an installation per calendar year, or any other 12-month period, less any VOCs that are recovered for reuse;

25. *input* shall mean the quantity of organic solvents and their quantity in preparations used when carrying out an activity, including the solvents recycled inside and outside the installation, and which are counted every time they are used to carry out the activity;

26. *reuse of organic solvents* shall mean the use of organic solvents recovered from an installation for any technical or commercial purpose and including use as a fuel but excluding the final disposal of such recovered organic solvent as waste;

27. *mass flow* shall mean the quantity of VOCs released, in unit of mass/hour;

28. *nominal capacity* shall mean the maximum mass input of organic solvents by an installation averaged over one day, if the installation is operated under conditions of normal operation at its design output;

29. *normal operation* shall mean all periods of operation of an installation or activity except start-up and shut-down operations and maintenance of equipment;

30. *contained conditions* shall mean conditions under which an installation is operated such that the VOCs released from the activity are collected and discharged in a controlled way either via a stack or abatement equipment and are therefore not entirely fugitive;

31. *standard conditions* shall mean a temperature of 273,15 K and a pressure of 101,3 kPa;

32. *average over 24 hours* shall mean the arithmetic average of all valid readings taken during the 24-hour period of normal operation;

33. *start-up and shut-down operations* shall mean operations whilst bringing an activity, an equipment item or a tank into or out of service or into or out of an idling state. Regularly oscillating activity phases are not to be considered as start-ups and shut-downs.

Article 3

Obligations applying to new installations

Member States shall adopt the necessary measures to ensure that:

1. all new installations comply with Articles 5, 8 and 9;

2. all new installations not covered by Directive 96/61/EC are registered or undergo authorisation before being put into operation.

Article 4

Obligations applying to existing installations

Without prejudice to Directive 96/61/EC, Member States shall adopt the necessary measures to ensure that:

1. existing installations comply with Articles 5, 8 and 9 no later than 31 October 2007;

2. all existing installations must have been registered or authorised by 31 October 2007 at the latest;

3. those installations to be authorised or registered using the reduction scheme of Annex IIB notify this to the competent authorities by 31 October 2005 at the latest;

4. where an installation:

   — undergoes a substantial change, or

   — comes within the scope of this Directive for the first time following a substantial change,

   that part of the installation which undergoes the substantial change shall be treated either as a new installation or as an existing installation, provided that the total emissions of the whole installation do not exceed those that would have resulted had the substantially changed part been treated as a new installation.

Article 5

Requirements

1. Member States shall take the appropriate measures, either by specification in the conditions of the authorisation or by general binding rules to ensure that paragraphs 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 emission limit values, and other requirements laid down in Annex IIA;

or

(b) the requirements of the reduction scheme specified in Annex IIB.

3. (a) For fugitive emissions, Member States shall apply fugitive emission values to installations as an emission limit value. However, where it is demonstrated to the satisfaction of the competent authority that for an individual installation this value is not technically and economically feasible, the competent authority can make an exception for such an individual installation provided that significant risks to human health or the environment are not to be expected. For each derogation, the operator must demonstrate to the satisfaction of the competent authority that the best available technique is being used;

(b) activities which cannot be operated under contained conditions may be exempted from the controls of Annex IIA, when this possibility is explicitly mentioned in that Annex. The reduction scheme of Annex IIB is then to be used, unless it is demonstrated to the satisfaction of the competent authority that this option is not technically and economically feasible. In this case, the operator must demonstrate to the satisfaction of the competent authority that the best available technique is being used.

Member States shall report to the Commission on the derogation concerning paragraphs (a) and (b) in accordance with Article 11.

4. For installations not using the reduction scheme, any abatement equipment installed after the date on which this Directive is brought into effect shall meet all the requirements of Annex IIA.

5. Installations where two or more activities are carried out, each of which exceeds the thresholds in Annex IIA shall:

(a) as regards the substances specified in paragraphs 6, 7 and 8, meet the requirements of those paragraphs for each activity individually;

(b) as regards all other substances, either:

   (i) meet the requirements of paragraph 2 for each activity individually; or

   (ii) have total emissions not exceeding those that would have resulted had point (i) been applied.

6. Substances or preparations which, because of their content of VOCs classified as carcinogens, mutagens, or toxic to reproduction under Directive 67/548/EEC [1], are assigned or need to carry the risk phrases R45, R46, R49, R60, R61, shall be replaced, as far as possible and by taking into account the guidance as mentioned in Article 7(1), by less harmful substances or preparations within the shortest possible time.

7. For discharges of the VOCs referred to in paragraph 6, where the mass flow of the sum of the compounds causing the labelling referred to in that paragraph is greater than, or equal to, 10 g/h, an emission limit value of 2 mg/Nm^3 shall be complied with. The emission limit value refers to the mass sum of the individual compounds.

8. For discharges of halogenated VOCs which are assigned the risk phrase R40, where the mass flow of the sum of the compounds causing the labelling R40 is greater than, or equal to, 100 g/h, an emission limit value of 20 mg/Nm^3 shall be complied with. The emission limit value refers to the mass sum of the individual compounds.

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. Discharges of those VOCs which, after the entry into force of this Directive, are assigned or need to carry one of the risk phrases mentioned in paragraphs 6 and 8, shall have to comply with the emission limit values mentioned in paragraphs 7 and 8 respectively, within the shortest possible time.

10. All appropriate precautions shall be taken to minimise emissions during start-up and shut-down.

11. Existing installations which operate existing abatement equipment and comply with the following emission limit values:

— 50 mg C/Nm^3 in the case of incineration,

— 150 mg C/Nm^3 in the case of any other abatement equipment,

shall be exempt from the waste gases emission limit values in the table in Annex IIA for a period of 12 years after the date referred to in Article 15, provided the total emissions of the whole installation do not exceed those that would have resulted had all the requirements of the table been met.

12. Neither the reduction scheme nor the application of paragraph 11 nor Article 6 exempt installations discharging substances specified in paragraphs 6, 7 and 8 from fulfilling the requirements of those paragraphs.

13. Where a risk assessment is carried out in accordance with Council Regulation (EEC) No 793/93 [2] and Commission Regulation (EC) No 1488/94 [3] or Council Directive 67/548/EEC and Commission Directive 93/67/EEC [4] of any of the substances causing the labelling R40, R60 or R61 which are controlled under this Directive, the Commission shall consider the conclusions of the risk assessment and shall take the necessary measures as appropriate.

Article 6

National plans

1. Without prejudice to Directive 96/61/EC, Member States may define and implement national plans for reducing emissions from the activities and industrial installations covered by Article 1, excluding activities 4 and 11 of Annex IIA. None of the other activities may be excluded from the scope of this Directive by means of a national plan. These plans shall result in a reduction of the annual emissions of VOCs from existing installations covered by this Directive by at least the same amount and within the same time frame as would have been achieved by applying the emission limits under Article 5(2) and (3) and Annex II, during the validity period of the national plan. The national plan, if necessary updated, will be resubmitted to the Commission every three years.

A Member State which defines and implements national plans may exempt existing installations from implementation of the emission limit values laid down in Article 5(2) and (3) and Annex II. A national plan may under no circumstances exempt an existing installation from the provisions laid down in Directive 96/61/EC.

2. A national plan shall include a list of the measures taken or to be taken to ensure that the aim specified in paragraph 1 will be achieved, including details of the proposed plan monitoring mechanism. It shall also include binding interim reduction targets against which progress towards the aim can be measured. It shall be compatible with the relevant existing Community legislation,

[1] OJ 196, 16.8.1967, p. 1. Directive as last amended by Commission Directive 98/98/EC (OJ L 355, 30.12.1998, p. 1).

[2] OJ L 84, 5.4.1993, p. 1.
[3] OJ L 161, 29.6.1994, p. 3.
[4] OJ L 227, 8.9.1993, p. 9.

including the relevant provisions of this Directive, and shall include:

— an identification of the activity or activities to which the plan applies,

— the reduction in emissions to be achieved by those activities which corresponds to that which would have been achieved by applying the emission limits as specified in paragraph 1,

— the number of installations affected by the plan and their total emissions and the total emission of each of the activities.

The plan shall also include a full description of the range of instruments through which its requirements will be achieved, evidence that these instruments will be enforceable and details of the means by which compliance with the plan will be demonstrated.

3. The Member State shall submit the plan to the Commission. The plan must be accompanied by supporting documentation sufficient to verify that the aim of paragraph 1 will be achieved, including any documentation specifically requested by the Commission. Existing installations undergoing a substantial change shall remain within the scope of the national plan, provided that they were part of this plan before undergoing such substantial change.

4. The Member State shall designate a national authority for the collection and evaluation of the information required by paragraph 3 and for the implementation of the national plan.

5. (a) The Commission shall inform the committee referred to in Article 13 of the criteria for assessing national plans, one year after the entry into force of this Directive at the latest.

(b) If the Commission, in considering the plan, the resubmitted plan, or in considering the progress reports submitted by the Member State under Article 11, is not satisfied that the objectives of the plan will be achieved within the prescribed period, it shall inform the Member State and the committee referred to in Article 13 of its opinion and of the reasons for reaching such an opinion. It shall do so within six months of receipt of the plan or report. The Member State shall then notify the Commission and inform the committee, within three months, of the corrective measures it will take in order to ensure that the objectives are achieved.

6. If the Commission decides within six months of the notification of the corrective measures that those measures are insufficient to ensure that the objective of the plan is achieved within the prescribed period, the Member State shall be obliged to satisfy the requirements of Article 5(2) and (3) and Annex II within the period specified in this Directive in the case of existing installations. The Commission shall inform the committee referred to in Article 13 of its decision.

Article 7

Substitution

1. The Commission shall ensure that an exchange of information between Member States and the activities concerned on the use of organic substances and their potential substitutes takes place. It shall consider the questions of:

— fitness for use,

— potential effects on human health and occupational exposure in particular;

— potential effects on the environment, and

— the economic consequences, in particular, the costs and benefits of the options available,

with a view to providing guidance on the use of substances and techniques which have the least potential effects on air, water, soil, ecosystems and human health. Following the exchange of information, the Commission shall publish guidance for each activity.

2. Member States shall ensure that the guidance referred to in paragraph 1 is taken into account during authorisation and during the formulation of general binding rules.

Article 8

Monitoring

1. Member States shall introduce an obligation for the operator of an installation covered by this Directive to supply the competent authority once a year or on request with data that enables the competent authority to verify compliance with this Directive.

2. Member States shall ensure that channels to which abatement equipment is connected, and which at the final point of discharge emit more than an average of 10 kg/h of total organic carbon, are monitored continuously for compliance.

3. In the other cases, Member States shall ensure that either continuous or periodic measurements are carried out. For periodic measurements at least three readings shall be obtained during each measurement exercise.

4. Measurements are not required in the case where end-of-pipe abatement equipment is not needed to comply with this Directive.

5. The Commission shall organise an exchange of information on the use of solvent management plans in Member States based on the data for the implementation of this Directive in the three years following the date referred to in Article 15.

Article 9

Compliance with emission limit values

1. Compliance with the following shall be demonstrated to the satisfaction of the competent authority:

— emission limit values in waste gases, fugitive emission values and total emission limit values,

— the requirements of the reduction scheme under Annex IIB,

— the provisions of Article 5(3).

Guidance is provided in Annex III on solvent management plans serving to demonstrate compliance with these parameters.

Gas volumes may be added to the waste gas for cooling or dilution purposes where technically justified but shall not be considered when determining the mass concentration of the pollutant in the waste gas.

2. Following a substantial change, compliance shall be reverified.

3. In the case of continuous measurements the emission limit values shall be considered to be complied with if:

(a) none of the averages over 24 hours of normal operation exceeds the emission limit values, and

(b) none of the hourly averages exceeds the emission limit values by more than a factor of 1,5.

4. In the case of periodic measurements the emission limit values shall be considered to be complied with if, in one monitoring exercise:

(a) the average of all the readings does not exceed the emission limit values, and

(b) none of the hourly averages exceeds the emission limit value by more than a factor of 1,5.

5. Compliance with the provisions of Article 5(7) and (8) shall be verified on the basis of the sum of the mass concentrations of the individual volatile organic compounds concerned. For all other cases, compliance shall be verified on the basis of the total mass of organic carbon emitted unless otherwise specified in Annex IIA.

Article 10

Non-compliance

Member States shall take appropriate measures to ensure that, if it is found that the requirements of this Directive have been breached:

(a) the operator informs the competent authority and takes measures to ensure that compliance is restored within the shortest possible time;

(b) in cases of non-compliance causing immediate danger to human health and as long as compliance is not restored under the conditions of paragraph (a), operation of the activity is suspended.

Article 11

Information systems and reporting

1. At intervals of three years, Member States shall send information to the Commission on the implementation of this Directive in the form of a report. The report shall be drawn up on the basis of a questionnaire or outline drafted by the Commission in accordance with the procedure laid down in Article 6 of Directive 91/692/EEC [1]. The questionnaire or outline shall be sent to the Member States six months before the start of the period covered by the report. The report shall be made to the Commission within nine months of the end of the three-year period covered by it. Member States shall publish the reports produced at the same time as they are transmitted to the Commission, subject to the restrictions laid down in Article 3(2) and (3) of Directive 90/313/EEC [2]. The first report shall cover the period of the first three years after the date referred to in Article 15.

2. The information submitted under paragraph 1 shall, in particular, include sufficient representative data to demonstrate that the requirements of Article 5 and as the case may be, the requirements of Article 6 have been complied with.

3. The Commission shall draw up a report on the implementation of this Directive on the basis of the data provided by the Member States at the latest five years after the first reports are submitted by the Member States. The Commission shall submit this report to the European Parliament and the Council, accompanied by proposals if necessary.

Article 12

Public access to information

1. Without prejudice to Directive 90/313/EEC, Member States shall take the necessary measures to ensure that at

(1) OJ L 377, 31.12.1991, p. 48.
(2) OJ L 158, 23.6.1990, p. 56.

least applications for authorisation for new installations or for substantial changes of those installations requiring a permit under Directive 96/61/EC are made available for an appropriate period of time to the public, to enable it to comment on them before the competent authority reaches a decision. Without prejudice to Directive 96/61/EC, no obligation to reformat the information for the public is implied.

The decision of the competent authority, including at least a copy of the authorisation, and any subsequent updates, must also be made available to the public.

The general binding rules applicable for installations and the list of registered and authorised activities shall be made available to the public.

2. The results of emission-monitoring as required under the authorisation or registration conditions referred to in Articles 8 and 9 and held by the competent authority must be made available to the public.

3. Paragraphs 1 and 2 shall apply, subject to the restrictions regarding grounds for refusal by public authorities to provide information, including commercial and industrial confidentiality, laid down in Article 3(2) and (3) of Directive 90/313/EEC.

Article 13

Committee

The Commission shall be assisted by a committee of an advisory nature composed of the representatives of the Member States and chaired by the representative of the Commission.

The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft, within a time limit which the chairman may lay down according to the urgency of the matter, if necessary by taking a vote.

The opinion shall be recorded in the minutes; in addition, each Member State shall have the right to ask to have its position recorded in the minutes.

The Commission shall take the utmost account of the opinion delivered by the committee. It shall inform the committee of the manner in which its opinion has been taken into account.

Article 14

Sanctions

Member States shall determine the sanctions applicable to breaches of the national provisions adopted pursuant to this Directive and shall take all necessary measures for their implementation. The sanctions determined must be effective, proportionate and dissuasive. Member States shall notify these provisions to the Commission at the latest by the date mentioned in Article 15, and shall notify any subsequent modification of them as soon as possible.

Article 15

Transposition

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later than ... April 2001. They shall forthwith inform the Commission thereof.

When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such a reference on the occasion of their official publication. The methods of making such a reference shall be laid down by the Member States.

2. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

Article 16

Entry into force

This Directive shall enter into force on the day of its publication in the *Official Journal of the European Communities*.

Article 17

Addressees

This Directive is addressed to the Member States.

Done at Brussels, 11 March 1999.

For the Council

The President

J. TRITTIN

ANNEX I

SCOPE

This Annex contains the categories of activity referred to in Article 1. When operated above the thresholds 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

— Any activity in which an adhesive is applied to a surface, with the exception of adhesive coating and laminating associated with printing activities.

Coating activity

— Any activity in which a single or multiple application of a continuous film of a coating is applied to:

  — vehicles as listed below:

    — new cars, defined as vehicles of category M1 in Directive 70/156/EEC (1), and of category N1 in so far as they are coated at the same installation as M1 vehicles,

    — truck cabins, defined as the housing for the driver, and all integrated housing for the technical equipment, of vehicles of categories N2 and N3 in Directive 70/156/EEC,

    — vans and trucks, defined as vehicles of categories N1, N2 and N3 in Directive 70/156/EEC, but not including truck cabins,

    — buses, defined as vehicles of categories M2 and M3 in Directive 70/156/EEC,

  — trailers, defined in categories O1, O2, O3 and O4 in Directive 70/156/EEC,

  — metallic and plastic surfaces including surfaces of airplanes, ships, trains, etc.,

  — wooden surfaces,

  — textile, fabric, film and paper surfaces,

  — leather.

  It does not include the coating of substrate with metals by electrophoretic and chemical spraying techniques. If the coating activity includes a step in which the same article is printed by whatever technique used, that printing step is considered part of the coating activity. However, printing activities operated as a separate activity are not included, but may be covered by the Directive if the printing activity falls within the scope thereof.

Coil coating

— Any activity where coiled steel, stainless steel, 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 with the exception of the manual removal of stains and spots in the textile and clothing industry.

(1) OJ L 42, 23.2.1970, p. 1. Directive as last amended by Directive 97/27/EC (OJ L 233, 25.8.1997, p. 1).

Footwear manufacture

— Any activity of producing complete footwear or parts thereof.

Manufacturing of coating preparations, varnishes, inks and adhesives

— The manufacture of the above final products, and of intermediates where carried out at the same site, by mixing of pigments, resins and adhesive materials with organic solvent or other carrier, including dispersion and predispersion activities, viscosity and tint adjustments and operations for filling the final product into its container.

Manufacturing of pharmaceutical products

— The chemical synthesis, fermentation, extraction, formulation and finishing of pharmaceutical products and where carried out at the same site, the manufacture of intermediate products.

Printing

— Any reproduction activity of text and/or images in which, with the use of an image carrier, ink is transferred onto whatever type of surface. It includes associated varnishing, coating and laminating techniques. However, only the following sub-processes are subject to the Directive:

  — *flexography* — a printing activity using an image carrier of rubber or elastic photopolymers on which the printing areas are above the non-printing areas, using liquid inks which dry through evaporation,

  — *heatset web offset* — a web-fed printing activity using an image carrier in which the printing and non-printing area are in the same plane, where web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets. The non-printing area is treated to attract water and thus reject ink. The printing area is treated to receive and transmit ink to the surface to be printed. Evaporation takes place in an oven where hot air is used to heat the printed material,

  — *laminating associated to a printing activity* — the adhering together of two or more flexible materials to produce laminates,

  — *publication rotogravure* — a rotogravure printing activity used for printing paper for magazines, brochures, catalogues or similar products, using toluene-based inks,

  — *rotogravure* — a printing activity using a cylindrical image carrier in which the printing area is below the non-printing area, using liquid inks which dry through evaporation. The recesses are filled with ink and the surplus is cleaned off the non-printing area before the surface to be printed contacts the cylinder and lifts the ink from the recesses,

  — *rotary screen printing* — a web-fed printing activity in which the ink is passed onto the surface to be printed by forcing it through a porous image carrier, in which the printing area is open and the non-printing area is sealed off, using liquid inks which dry only through evaporation. Web-fed means that the material to be printed is fed to the machine from a reel as distinct from separate sheets,

  — *varnishing* — an activity by which a varnish or an adhesive coating for the purpose of later sealing the packaging material is applied to a flexible material.

Rubber conversion

— Any activity of mixing, milling, blending, calendering, extrusion and vulcanisation of natural or synthetic rubber and any ancillary operations for converting natural or synthetic rubber into a finished product.

Surface cleaning

— Any activity except dry cleaning using organic solvents to remove contamination from the surface of material including degreasing. A cleaning activity consisting of more than one step before or after any

other activity shall be considered as one surface cleaning activity. This activity does not refer to the cleaning of the equipment but to the cleaning of the surface of products.

Vegetable oil and animal fat extraction and vegetable oil refining activities

— Any activity to extract vegetable oil from seeds and other vegetable matter, the processing of dry residues to produce animal feed, the purification of fats and vegetable oils derived from seeds, vegetable matter and/or animal matter.

Vehicle refinishing

— Any industrial or commercial coating activity and associated degreasing activities performing:

  — the coating of road vehicles as defined in Directive 70/156/EEC, or part of them, carried out as part of vehicle repair, conservation or decoration outside of manufacturing installations, or

  — the original coating of road vehicles as defined in Directive 70/156/EEC or part of them with refinishing-type materials, where this is carried out away from the original manufacturing line, or

  — the coating of trailers (including semi-trailers) (category O).

Winding wire coating

— Any coating activity of metallic conductors used for winding the coils in transformers and motors, etc.

Wood impregnation

— Any activity giving a loading of preservative in timber.

Wood and plastic lamination

— Any activity to adhere together wood and/or plastic to produce laminated products.

ANNEX IIA

I. THRESHOLDS AND EMISSION CONTROLS

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
1	Heatset web offset printing (> 15)	15—25 > 25	100 20	30 (1) 30 (1)				(1) Solvent residue in finished product is not to be considered as part of fugitive emissions.
2	Publication rotogravure (> 25)		75	10	15			
3	Other rotogravure, flexography, rotary screen printing, laminating or varnishing units (> 15) rotary screen printing on textile/cardboard (> 30)	15—25 > 25 > 30 (1)	100 100 100	25 20 20				(1) Threshold for rotary screen printing on textile and on cardboard.
4	Surface cleaning (1) (> 1)	1—5 > 5	20 (2) 20 (2)	15 10				(1) Using compounds specified in Article 5(6) and (8). (2) Limit refers to mass of compounds in mg/Nm^3, and not to total carbon.
5	Other surface cleaning (> 2)	2—10 > 10	75 (1) 75 (1)	20 (1) 15 (1)				(1) Installations which demonstrate to the competent authority that the average organic solvent content of all cleaning material used does not exceed 30 % by weight are exempt from application of these values.
6	Vehicle coating (< 15) and vehicle refinishing	> 0,5	50 (1)	25				(1) Compliance in accordance with Article 9(3) should be demonstrated based on 15 minute average measurements.

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/Nm³)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
7	Coil coating (> 25)		50 (1)	5	10			(1) For installations which use techniques which allow reuse of recovered solvents, the emission limit shall be 150.
8	Other coating, including metal, plastic, textile (5), fabric, film and paper coating (> 5)	5—15 > 15	100 (1) (4) 50/75 (2) (3) (4)	20 (4) 20 (4)				(1) Emission limit value applies to coating application and drying processes operated under contained conditions. (2) The first emission limit value applies to drying processes, the second to coating application processes. (3) For textile coating installations which use techniques which allow reuse of recovered solvents, the emission limit applied to coating application and drying processes taken together shall be 150. (4) Coating activities which cannot be applied under contained conditions (such as shipbuilding, aircraft painting) may be exempted from these values, in accordance with Article 5(3)(b). (5) Rotary screen printing on textile is covered by activity No 3.
9	Winding wire coating (> 5)					10 g/kg (1) 5 g/kg (2)		(1) Applies for installations where average diameter of wire ≤ 0,1 mm. (2) Applies for all other installations.
10	Coating of wooden surfaces (> 15)	15—25 > 25	100 (1) 50/75 (2)	25 20				(1) Emission limit applies to coating application and drying processes operated under contained conditions. (2) The first value applies to drying processes, the second to coating application processes.

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
11	Dry cleaning					20 g/kg (1) (2) (3)		(1) Expressed in mass of solvent emitted per kilogram of product cleaned and dried. (2) The emission limit in Article 5(8) does not apply for this sector. (3) The following exemption refers only to Greece: the total emission limit value does not apply, for a period of 12 years after the date on which this Directive is brought into effect, to existing installations located in remote areas and/or islands, with a population of no more than 2 000 permanent inhabitants where the use of advanced technology equipment is not economically feasible.
12	Wood impregnation (> 25)		100 (1)	45		11 kg/m^3		(1) Does not apply for impregnation with creosote.
13	Coating of leather (> 10)	10—25 > 25 (> 10) (1)				85 g/m^2 75 g/m^2 150 g/m^2		Emission limits are expressed in grams of solvent emitted per m^2 of product produced. (1) For leather coating activities in furnishing and particular leather goods used as small consumer goods like bags, belts, wallets, etc.
14	Footwear manufacture (> 5)					25 g per pair		Total emission limit values are expressed in grams of solvent emitted per pair of complete footwear produced.
15	Wood and plastic lamination (> 5)					30 g/m^2		

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
16	Adhesive coating (> 5)	5—15 > 15	50 (1) 50 (1)	25 20				(1) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150.
17	Manufacture of coating preparations, varnishes, inks and adhesives (> 100)	100—1 000 > 1 000	150 150	5 3		5 % of solvent input 3 % of solvent input		The fugitive emission value does not include solvent sold as part of a coatings preparation in a sealed container.
18	Rubber conversion (> 15)		20 (1)	25 (2)		25 % of solvent input		(1) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150. (2) The fugitive emission value does not include solvent sold as part of products or preparations in a sealed container.
19	Vegetable oil and animal fat extraction and vegetable oil refining activities (> 10)					Animal fat: 1,5 kg/tonne Castor: 3 kg/tonne Rape seed: 1 kg/tonne Sunflower seed: 1 kg/tonne Soya beans (normal crush): 0,8 kg/tonne Soya beans (white flakes): 1,2 kg/tonne Other seeds and other vegetable matter: 3 kg/tonne (1) 1,5 kg/tonne (2) 4 kg/tonne (3)		(1) Total emission limit values for installations processing individual batches of seeds and other vegetable matter should be set by the competent authority on a case-by-case basis, applying the best available techniques. (2) Applies to all fractionation processes excluding de-gumming (the removal of gums from the oil). (3) Applies to de-gumming.

	Activity (solvent consumption threshold in tonnes/year)	Threshold (solvent consumption threshold in tonnes/year)	Emission limit values in waste gases (mg C/Nm^3)	Fugitive emission values (percentage of solvent input)		Total emission limit values		Special provisions
				New	Existing	New	Existing	
20	Manufacturing of pharmaceutical products (> 50)		20 (1)	5 (2)	15 (2)	5 % of solvent input	15 % of solvent input	(1) If techniques are used which allow reuse of recovered solvent, the emission limit value in waste gases shall be 150. (2) The fugitive emission limit value does not include solvent sold as part of products or preparations in a sealed container.

II. THE VEHICLE COATING INDUSTRY

The total emission limit values are expressed in terms of grams of solvent emitted in relation to the surface area of product in square metres and in kilograms of solvent emitted in relation to the car body.

The surface area of any product dealt with in the table below is defined as follows:

— the surface area calculated from the total electrophoretic coating area, and the surface area of any parts that might be added in successive phases of the coating process which are coated with the same coatings as those used for the product in question, or the total surface area of the product coated in the installation.

The surface of the electrophoretic coating area is calculated using the formula:

$$\frac{2 \times \text{total weight of product shell}}{\text{average thickness of metal sheet} \times \text{density of metal sheet}}$$

This method shall also be applied for other coated parts made out of sheets.

Computer aided design or other equivalent methods shall be used to calculate the surface area of the other parts added, or the total surface area coated in the installation.

The total emission limit value in the table below refers to all process stages carried out at the same installation from electrophoretic coating, or any other kind of coating process, through to the final wax and polish of topcoating inclusive, as well as solvent used in cleaning of process equipment, including spray booths and other fixed equipment, both during and outside of production time. The total emission limit value is expressed as the mass sum of organic compounds per m^2 of the total surface area of coated product and as the mass sum of organic compounds per car body.

Activity (solvent consumption threshold in tonnes/year)	Production threshold (refers to annual production of coated item)	Total emission limit value	
		New	Existing
Coating of new cars (> 15)	> 5 000	45 g/m^2 or 1,3 kg/body + 33 g/m^2	60 g/m^2 or 1,9 kg/body + 41 g/m^2
	≤ 5 000 monocoque or > 3 500 chassis-built	90 g/m^2 or 1,5 kg/body + 70 g/m^2	90 g/m^2 or 1,5 kg/body + 70 g/m^2

Activity (solvent consumption threshold in tonnes/year)	Production threshold (refers to annual production of coated item)	Total emission limit value	
		New	Existing
		Total emission limit (g/m^2)	
Coating of new truck cabins (> 15)	≤ 5 000 > 5 000	65 55	85 75
Coating of new vans and trucks (> 15)	≤ 2 500 > 2 500	90 70	120 90
Coating of new buses (> 15)	≤ 2 000 > 2 000	210 150	290 225

Vehicle coating installations below the solvent consumption thresholds in the table above shall meet the requirements for the vehicle refinishing sector in Annex IIA.

ANNEX IIB

REDUCTION SCHEME

1. Principles

The purpose of the reduction scheme is to allow the operator the possibility to achieve by other means emission reductions, equivalent to those achieved if the emission limit values were to be applied. To that end the operator may use any reduction scheme, specially designed for his installation, provided that in the end an equivalent emission reduction is achieved. Member States shall report according to Article 11 of the Directive to the Commission about the progress in achieving the same emission reduction, including the experience from the application of the reduction scheme.

2. Practice

In the case of applying coatings, varnishes, adhesives or inks, the following scheme can be used. Where the following method is inappropriate the competent authority may allow an operator to apply any alternative exemption scheme which it is satisfied fulfils the principles outlined here. The design of the scheme takes into account the following facts:

(i) where substitutes containing little or no solvent are still under development, a time extension must be given to the operator to implement his emission reduction plans;

(ii) the reference point for emission reductions should correspond as closely as possible to the emissions which would have resulted had no reduction action been taken.

The following scheme shall operate for installations for which a constant solid content of product can be assumed and used to define the reference point for emission reductions:

(i) the operator shall forward an emission reduction plan which includes in particular decreases in the average solvent content of the total input and/or increased efficiency in the use of solids to achieve a reduction of the total emissions from the installation to a given percentage of the annual reference emissions, termed the target emission. This must be done on the following time frame:

Time period		Maximum allowed total annual emissions
New installations	Existing installations	
By 31.10.2001	By 31.10.2005	Target emission x 1,5
By 31.10.2004	By 31.10.2007	Target emission

(ii) The annual reference emission is calculated as follows:

(a) The total mass of solids in the quantity of coating and/or ink, varnish or adhesive consumed in a year is determined. Solids are all materials in coatings, inks, varnishes and adhesives that become solid once the water or the volatile organic compounds are evaporated.

(b) The annual reference emissions are calculated by multiplying the mass determined in (a) by the appropriate factor listed in the table below. Competent authorities may adjust these factors for individual installations to reflect documented increased efficiency in the use of solids.

Activity	Multiplication factor for use in item (ii)(b)
Rotogravure printing; flexography printing; laminating as part of a printing activity; varnishing as part of a printing activity; wood coating; coating of textiles, fabric film or paper; adhesive coating	4
Coil coating, vehicle refinishing	3
Food contact coating, aerospace coatings	2,33
Other coatings and rotary screen printing	1,5

(c) The target emission is equal to the annual reference emission multiplied by a percentage equal to:

— (the fugitive emission value + 15), for installations falling within item 6 and the lower threshold band of items 8 and 10 of Annex IIA,

— (the fugitive emission value + 5) for all other installations.

(d) Compliance is achieved if the actual solvent emission determined from the solvent management plan is less than or equal to the target emission.

ANNEX III

SOLVENT MANAGEMENT PLAN

1. Introduction

This Annex provides guidance on carrying out a solvent management plan. It identifies the principles to be applied (item 2) and provides a framework for the mass balance (item 3) and an indication of the requirements for verification of compliance (item 4).

2. Principles

The solvent management plan serves the following purposes:

(i) verification of compliance as specified in Article 9(1);

(ii) identification of future reduction options;

(iii) enabling of the provision of information on solvent consumption, solvent emissions and compliance with the Directive to the public.

3. Definitions

The following definitions provide a framework for the mass balance exercise.

Inputs of organic solvents (I):

I1 The quantity of organic solvents or their quantity in preparations purchased which are used as input into the process in the time frame over which the mass balance is being calculated.

I2 The quantity of organic solvents or their quantity in preparations recovered and reused as solvent input into the process. (The recycled solvent is counted every time it is used to carry out the activity.)

Outputs of organic solvents (O):

O1 Emissions in waste gases.

O2 Organic solvents lost in water, if appropriate taking into account waste water treatment when calculating O5.

O3 The quantity of organic solvents which remains as contamination or residue in products output from the process.

O4 Uncaptured emissions of organic solvents to air. This includes the general ventilation of rooms, where air is released to the outside environment via windows, doors, vents and similar openings.

O5 Organic solvents and/or organic compounds lost due to chemical or physical reactions (including for example those which are destroyed, e.g. by incineration or other waste gas or waste water treatments, or captured, e.g. by adsorption, as long as they are not counted under O6, O7 or O8).

O6 Organic solvents contained in collected waste.

O7 Organic solvents, or organic solvents contained in preparations, which are sold or are intended to be sold as a commercially valuable product.

O8 Organic solvents contained in preparations recovered for reuse but not as input into the process, as long as not counted under O7.

O9 Organic solvents released in other ways.

4. Guidance on use of the solvent management plan for verification of compliance

The use made of the solvent management plan will be determined by the particular requirement which is to be verified, as follows:

(i) Verification of compliance with the reduction option in Annex IIB, with a total emission limit value expressed in solvent emissions per unit product, or otherwise stated in Annex IIA.

(a) For all activities using Annex IIB the solvent management plan should be done annually to determine consumption (C). Consumption can be calculated according to the following equation:

$$C = I1 - O8$$

A parallel exercise should also be undertaken to determine solids used in coating in order to derive the annual reference emission and the target emission each year.

(b) For assessing compliance with a total emission limit value expressed in solvent emissions per unit product or otherwise stated in Annex IIA, the solvent management plan should be done annually to determine emissions (E). Emissions can be calculated according to the following equation:

$$E = F + O1$$

where F is the fugitive emission as defined in section (ii)(a). The emission figure should then be divided by the relevant product parameter.

(c) For assessing compliance with the requirements of Article 5(5)(b)(ii), the solvent management plan should be done annually to determine total emissions from all activities concerned, and that figure should then be compared with the total emissions that would have resulted had the requirements of Annex II been met for each activity separately.

(ii) Determination of fugitive emissions for comparison with fugitive emission values in Annex IIA:

(a) *Methodology*

The fugitive emission can be calculated according to the following equation:

$$F = I1 - O1 - O5 - O6 - O7 - O8$$

or

$$F = O2 + O3 + O4 + O9$$

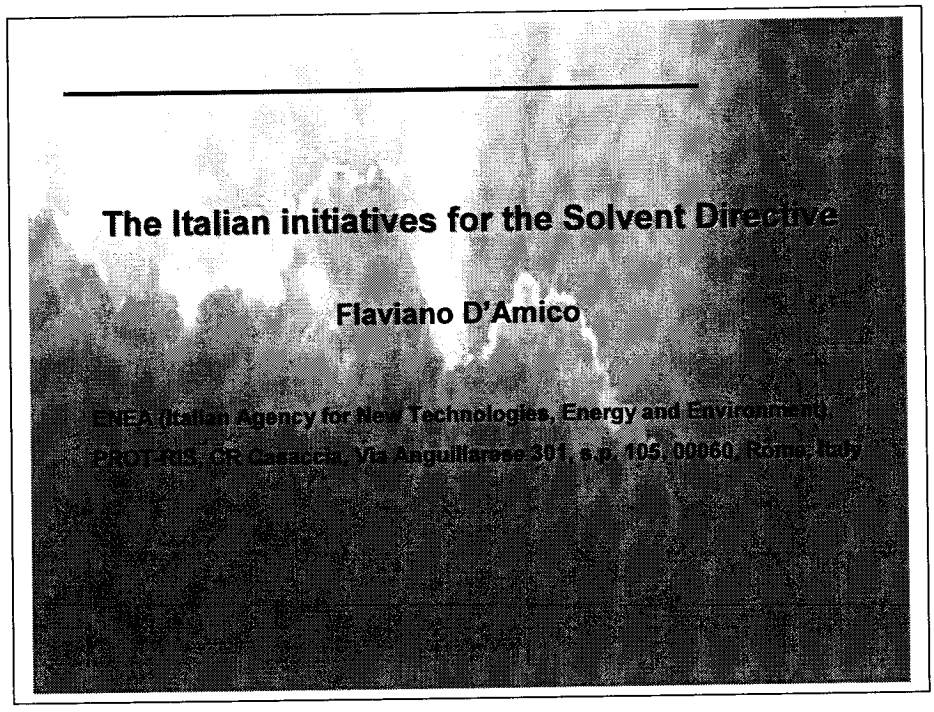
This quantity can be determined by direct measurement of the quantities. Alternatively, an equivalent calculation can be made by other means, for instance by using the capture efficiency of the process.

The fugitive emission value is expressed as a proportion of the input, which can be calculated according to the following equation:

$$I = I1 + I2$$

(b) *Frequency*

Determination of fugitive emissions can be done by a short but comprehensive set of measurements. It need not be done again until the equipment is modified.


The Italian initiatives for the Solvent Directive
Flaviano D'Amico
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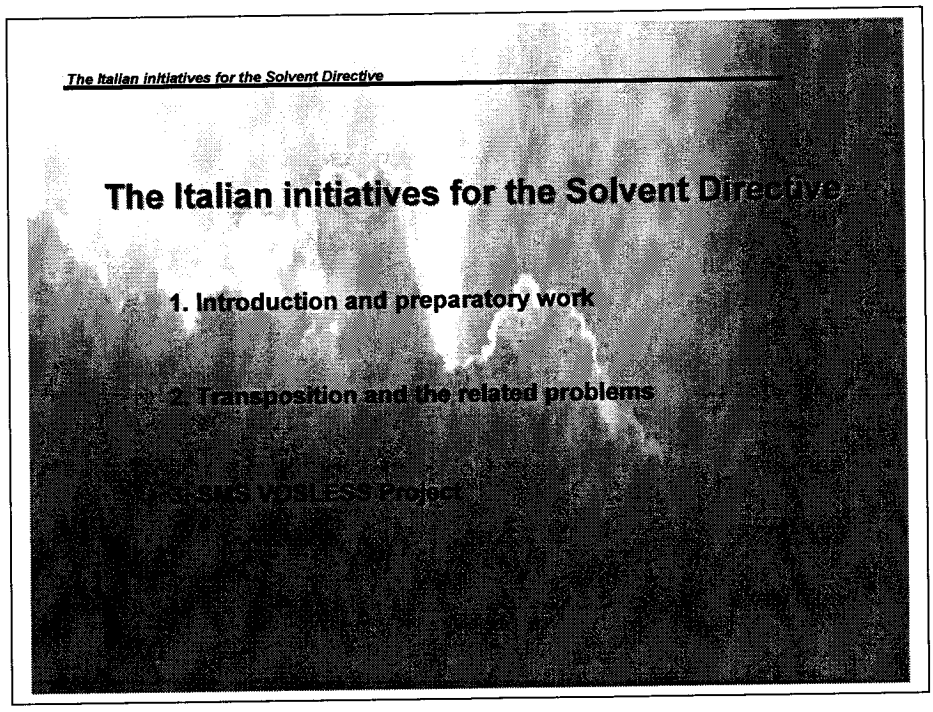
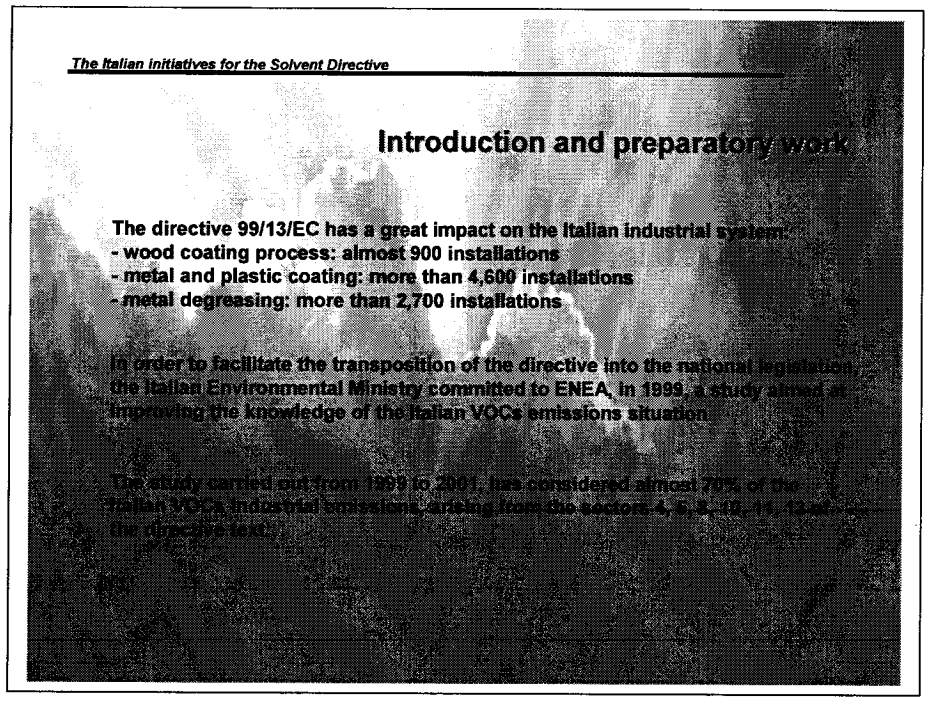
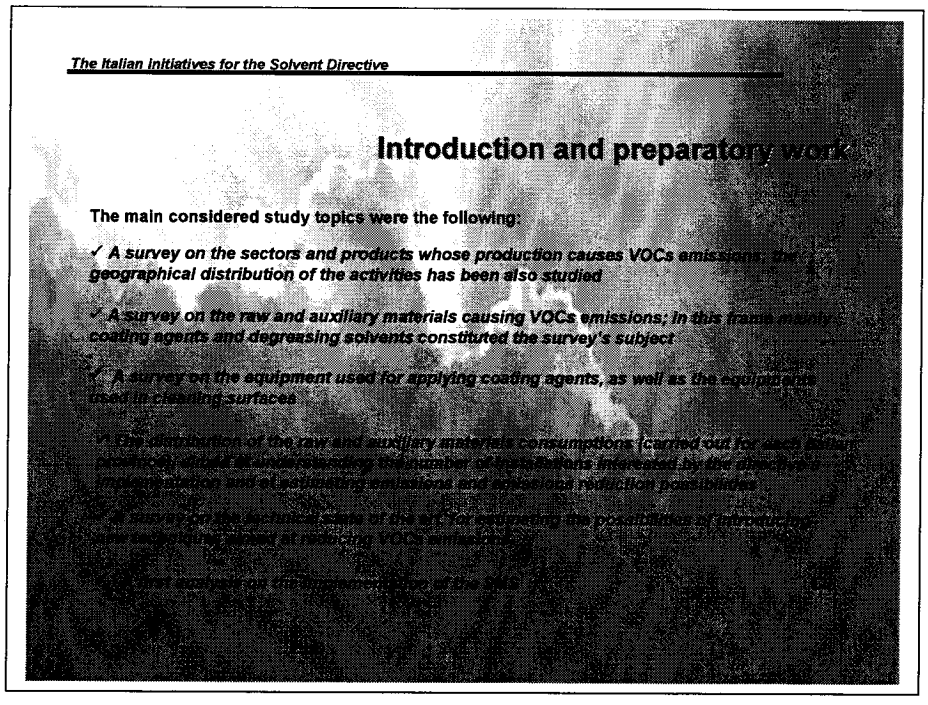
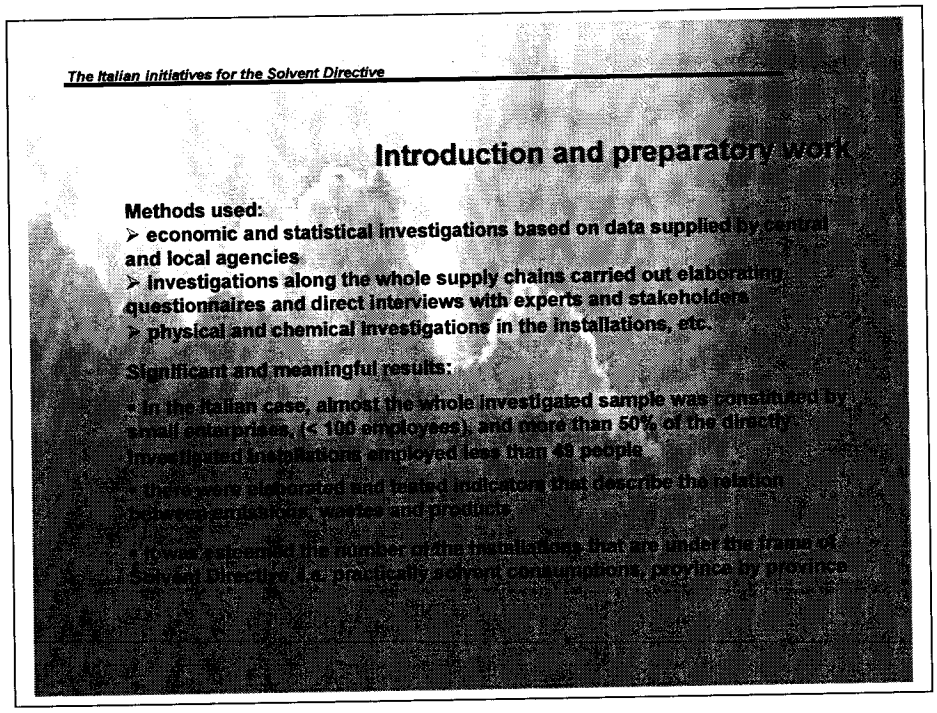
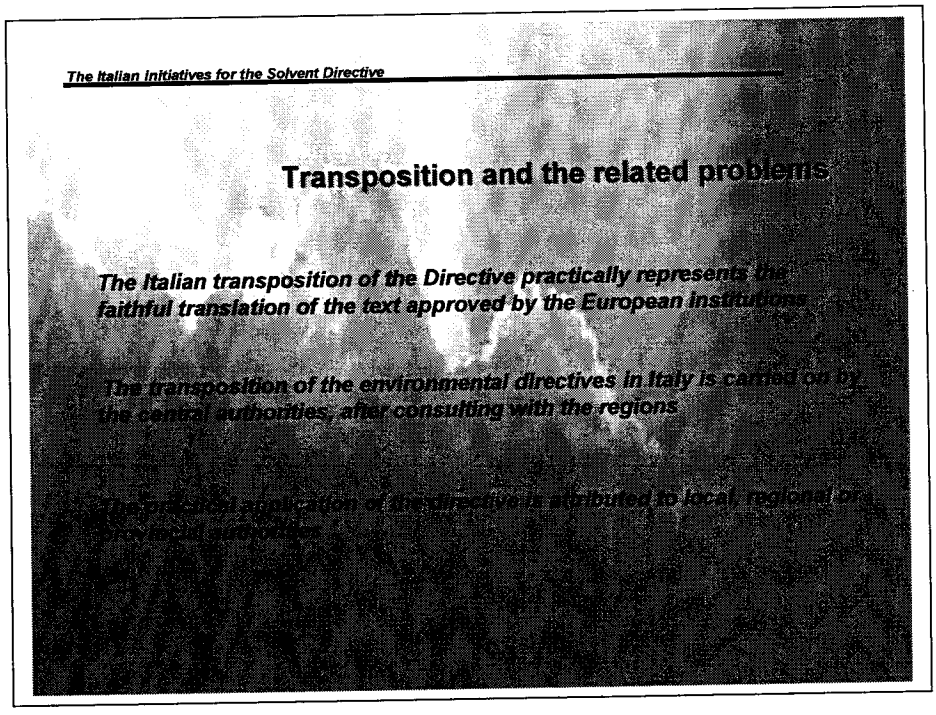
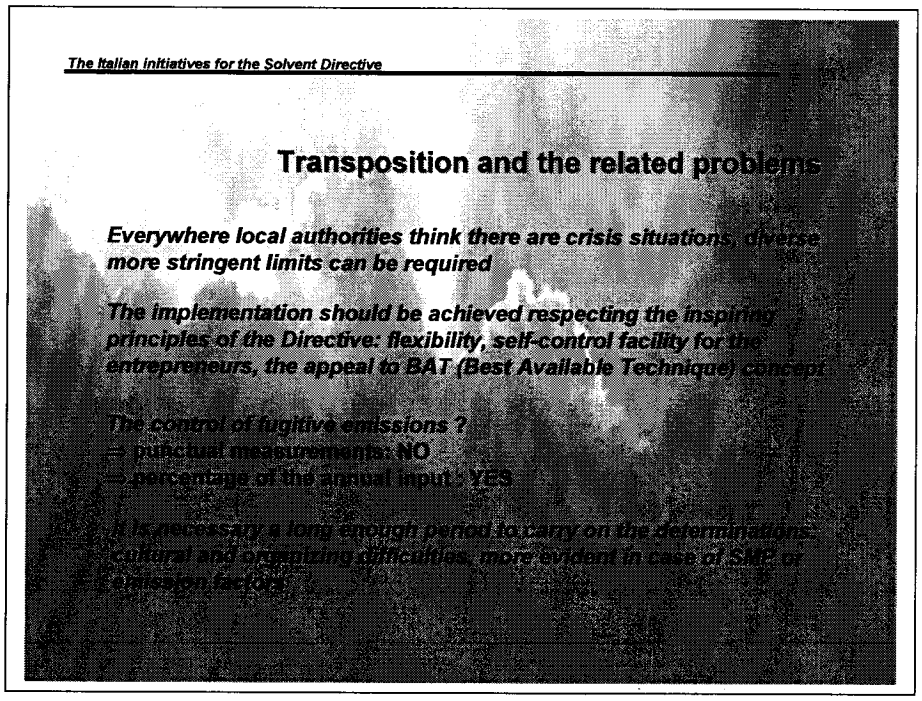

The Italian initiatives for the Solvent Directive
The Italian initiatives for the Solvent Directive
1. Introduction and preparatory work
2. Transposition and the related problems
3. The VOSLESS Project

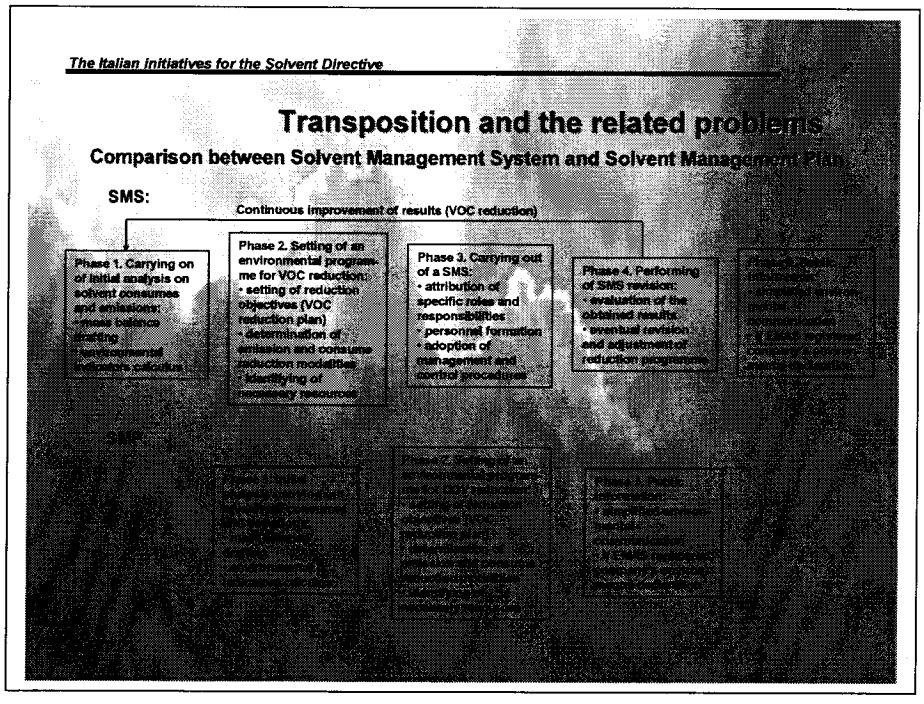

The Italian initiatives for the Solvent Directive
Introduction and preparatory work
The directive 99/13/EC has a great impact on the Italian industrial system:
- wood coating process: almost 900 installations
- metal and plastic coating: more than 4,600 installations
- metal degreasing: more than 2,700 installations
In order to facilitate the transposition of the directive into the national legislation, the Italian Environmental Ministry committed to ENEA, in 1999, a study aimed at improving the knowledge of the Italian VOCs emissions situation.
The study carried out from 1999 to 2001, has considered almost 70% of the Italian VOCs industrial emissions, arising from the sectors 4, 5, 8, 10, 11, 12 of the the directive text.

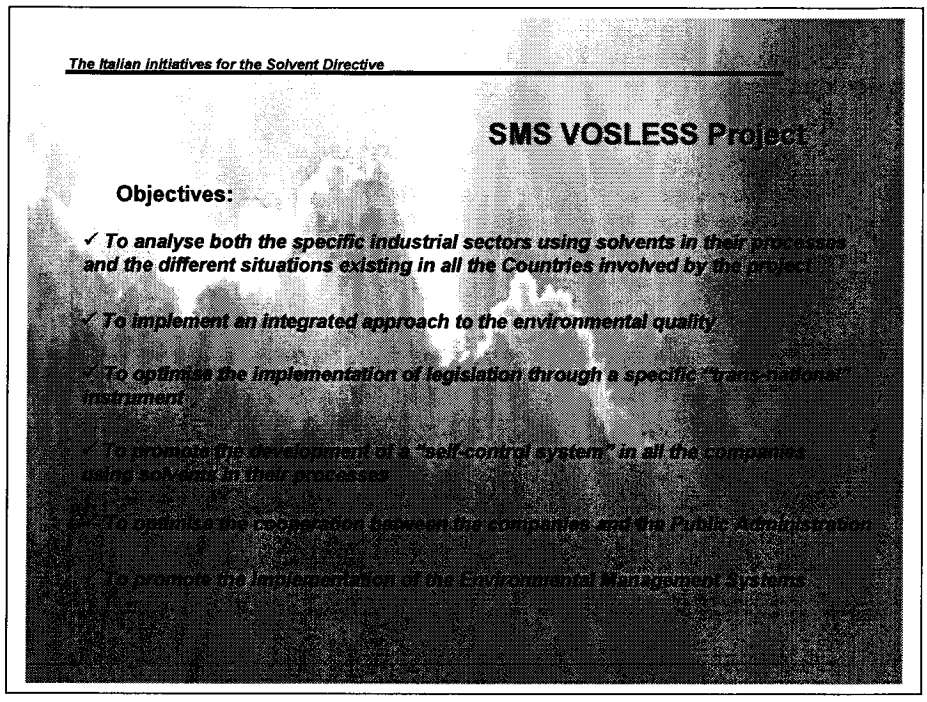

The Italian initiatives for the Solvent Directive
Introduction and preparatory work
The main considered study topics were the following:
✓ A survey on the sectors and products whose production causes VOCs emissions; the geographical distribution of the activities has been also studied
✓ A survey on the raw and auxiliary materials causing VOCs emissions; in this frame mainly coating agents and degreasing solvents constituted the survey's subject
✓ A survey on the equipment used for applying coating agents, as well as the equipments used in cleaning surfaces

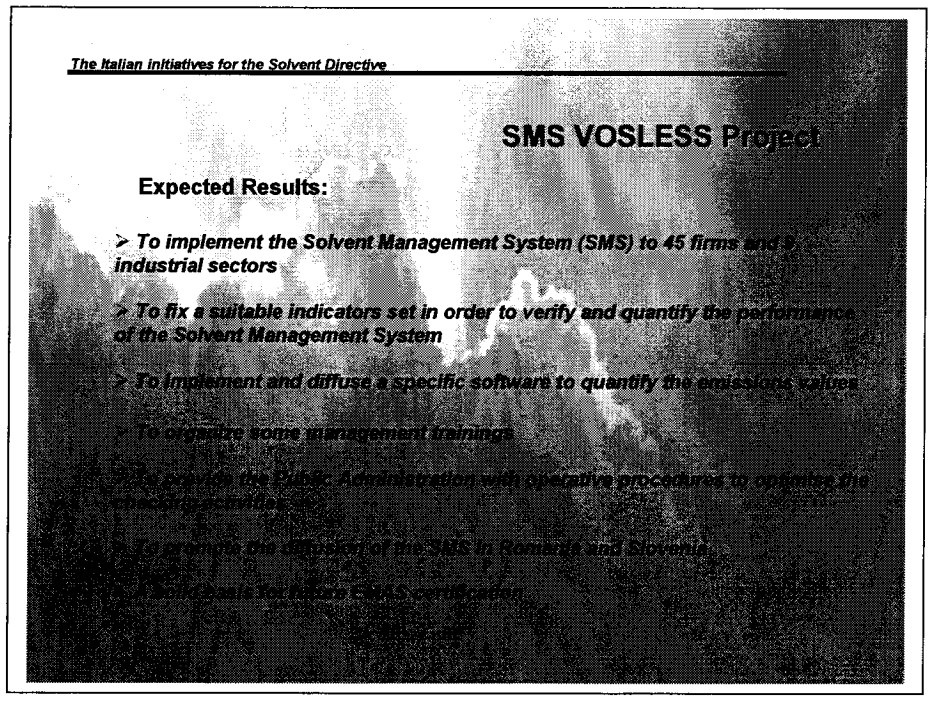

The Italian initiatives for the Solvent Directive
Introduction and preparatory work
Methods used:
➢ economic and statistical investigations based on data supplied by central and local agencies
➢ investigations along the whole supply chains carried out elaborating questionnaires and direct interviews with experts and stakeholders
➢ physical and chemical investigations in the installations, etc.
Significant and meaningful results:
• In the Italian case, almost the whole investigated sample was constituted by small enterprises, (< 100 employees), and more than 50% of the directly investigated installations employed less than 49 people
• there were elaborated and tested indicators that describe the relation between emissions, wastes and products
• it was estimated the number of the installations that are under the frame of Solvent Directive, i.e. practically solvent consumptions, province by province

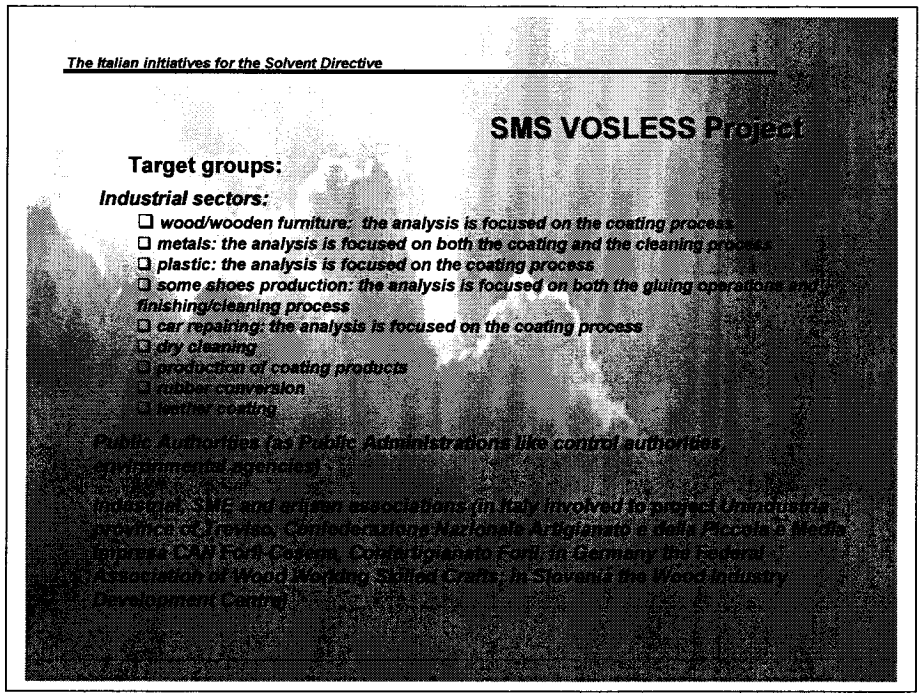

The Italian initiatives for the Solvent Directive
Transposition and the related problems
The Italian transposition of the Directive practically represents the faithful translation of the text approved by the European institutions
The transposition of the environmental directives in Italy is carried out by the central authorities, after consulting with the regions
The practical application of the directive is attributed to local, regional or provincial authorities

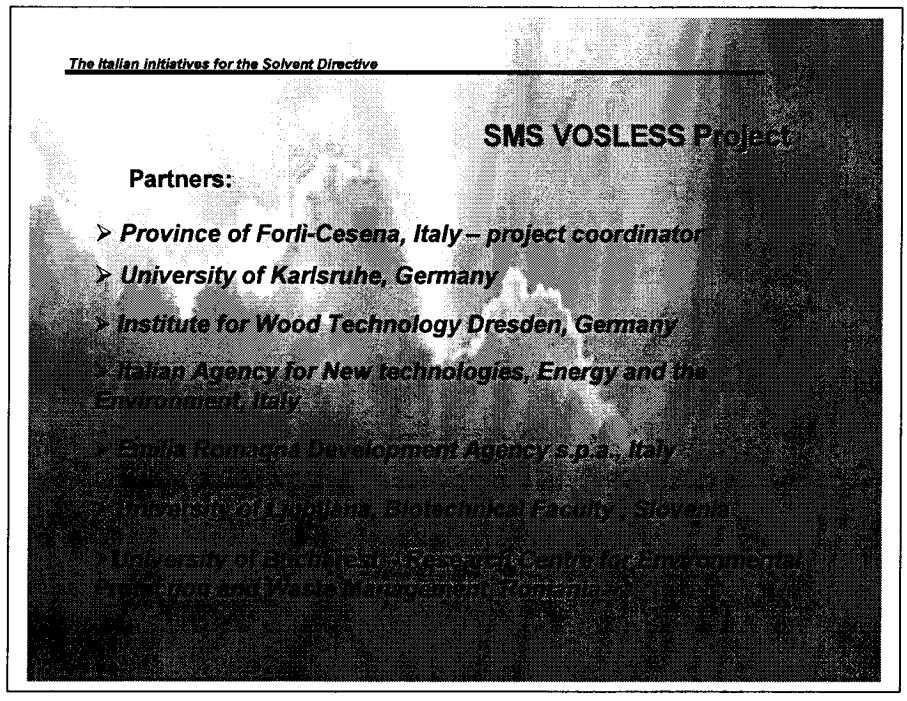

The Italian initiatives for the Solvent Directive
Transposition and the related problems
Everywhere local authorities think there are crisis situations, diverse more stringent limits can be required
The implementation should be achieved respecting the inspiring principles of the Directive: flexibility, self-control facility for the entrepreneurs, the appeal to BAT (Best Available Technique) concept
The control of fugitive emissions ?
⇒ punctual measurements: NO
⇒ percentage of the annual input: YES
It is necessary a long enough period to carry on the determinations
Cultural and organizing difficulties, more evident in case of SME or
Emission factors


The Italian initiatives for the Solvent Directive
Transposition and the related problems
Comparison between Solvent Management System and Solvent Management Plan
SMS:
Continuous improvement of results (VOC reduction)
Phase 1. Carrying on of initial analysis on solvent consumes and emissions:
Phase 2. Setting of an environmental programme for VOC reduction:
• setting of reduction objectives (VOC reduction plan)
• determination of emission and consume reduction modalities
• identifying of necessary resources
Phase 3. Carrying out of a SMS:
• attribution of specific roles and responsibilities
• personnel formation
• adoption of management and control procedures
Phase 4. Performing of SMS revision:
• evaluation of the obtained results
• eventual revision and adjustment of reduction programme


The Italian initiatives for the Solvent Directive
SMS VOSLESS Project
Objectives:
✓ To analyse both the specific industrial sectors using solvents in their processes and the different situations existing in all the Countries involved by the project
✓ To implement an integrated approach to the environmental quality
✓ To optimise the implementation of legislation through a specific "trans-national" instrument
✓ To promote the development of a "self-control system" in all the companies using solvents in their processes
✓ To optimise the cooperation between the companies and the Public Administration
✓ To promote the implementation of the Environmental Management Systems


The Italian initiatives for the Solvent Directive
SMS VOSLESS Project
Expected Results:
➢ To implement the Solvent Management System (SMS) to 45 firms and 9 industrial sectors
➢ To fix a suitable indicators set in order to verify and quantify the performance of the Solvent Management System
➢ To implement and diffuse a specific software to quantify the emissions values
➢ To organize some management trainings
➢ To provide the Public Administration with operative procedures to optimise the checking activities
➢ To promote the diffusion of the SMS in Romania and Slovenia
➢ A solid basis for future EMAS certification


The Italian initiatives for the Solvent Directive
SMS VOSLESS Project
Target groups:
Industrial sectors:
wood/wooden furniture: the analysis is focused on the coating process
metals: the analysis is focused on both the coating and the cleaning process
plastic: the analysis is focused on the coating process
some shoes production: the analysis is focused on both the gluing operations and the finishing/cleaning process
car repairing: the analysis is focused on the coating process
dry cleaning
production of coating products
rubber conversion
leather coating
Public Authorities (as Public Administrations like control authorities, environmental agencies)
Industrial, SME and artisan associations (in Italy involved to project Unindustria province of Treviso, Confederazione Nazionale Artigianato e della Piccola e Media Impresa CNA Forlì-Cesena, Cosa Artigianato Forlì; in Germany the Federal Association of Wood Working Skilled Crafts; in Slovenia the Wood Industry Development Centre)


The Italian initiatives for the Solvent Directive
SMS VOSLESS Project
Partners:
Province of Forlì-Cesena, Italy – project coordinator
University of Karlsruhe, Germany
Institute for Wood Technology Dresden, Germany
Italian Agency for New technologies, Energy and the Environment, Italy
Emilia Romagna Development Agency s.p.a., Italy
University of Ljubljana, Biotechnical Faculty , Slovenia
University of Bucharest - Research Centre for Environmental Protection and Waste Management, Romania

The VOC Regulation in Switzerland

Ursula Finsterwald
Swiss Agency for the Environment,
Forests and Landscape (SAEFL)

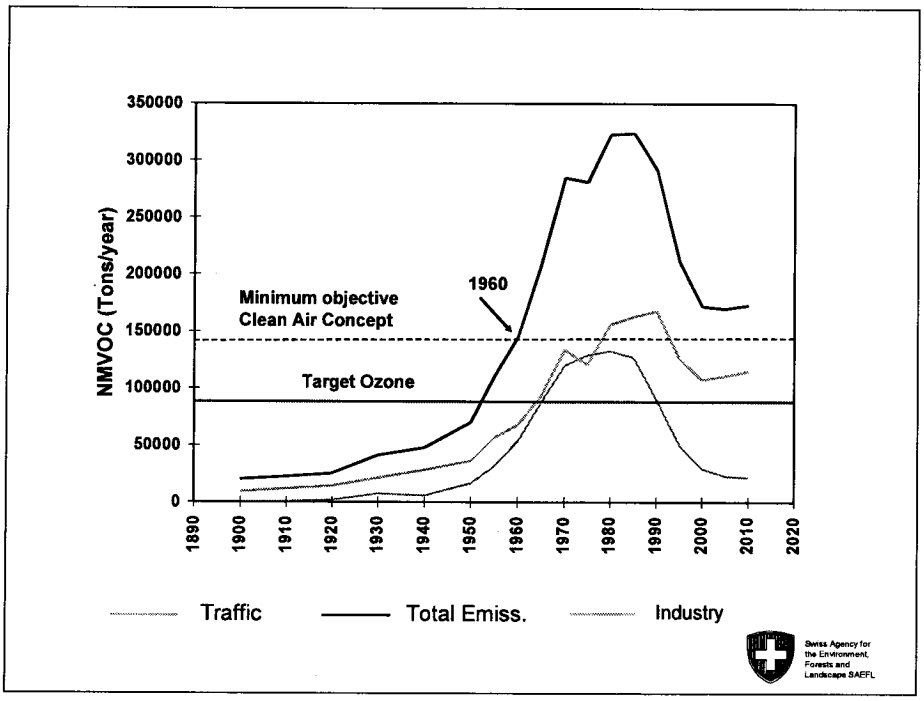
IMPEL VOC-Workshop
Salzburg
21-23 September 2005

Swiss Agency for the Environment, Forests and Landscape SAEFL

Overview

- VOC Emissions in Switzerland
- Regulatory Framework
- System of Collection
- Exemption and Refund
- Distribution of Revenue

Swiss Agency for the Environment, Forests and Landscape SAEFL



VOC Emissions in Switzerland

NMVOC-Emissions 1900 - 2010 in Tons per year

Year	1900	1930	1950	1960	1970	1980
Traffic	114	7'500	16'600	53'800	120'000	133'000
Industry	9'130	21'300	36'100	67'800	134'000	156'000
Forest/Agric	7'610	7'200	10'100	13'300	15'700	17'100
Households	3'260	5'100	7'010	10'500	15'700	16'700
Total Emis	20'100	41'100	69'900	145'000	285'000	323'000

Year	1990	1995	2000	2005	2010
Traffic	90'100	50'400	29'500	23'000	21'600
Industry	168'000	126'000	108'000	111'000	115'000
Forest/Agric	15'600	15'700	15'900	16'300	16'600
Households	17'900	18'400	18'800	19'100	19'400
Total Emiss	292'000	211'000	172'000	170'000	173'000

Swiss Agency for the Environment, Forests and Landscape SAEFL

Regulatory Framework

- Environmental Protection Law of 7 October 1983
- Ordinance on Air Pollution Control of 16 December 1985
- Ordinance on Incentive taxes on Volatile Organic Compounds of 12 November 1997

Swiss Agency for the Environment, Forests and Landscape SAEFL

System of collection

- **VOC in terms of the Ordinance**
  - Vapour pressure $\geq$ 0.1 mbar (20°C)
  - Boiling point $\leq$ 240°C (1031.25 mbar)
- **Tax is collected when VOC**
  - Imported into Switzerland
  - Manufactured in Switzerland
  - Recycled and reclaimed VOCs are brought back to circulation

Swiss Agency for the Environment, Forests and Landscape SAEFL

- **List of Substances: Annex 1 of the Ordinance**
  only substances figure on this list that are:
  - Effectively being subject to the tax
  - Important criteria: over 100 tons emitted per year
- **List of Products: Annex 2 of the Ordinance**
  - Products containing more than 3 % of VOC
- **Rate of tax: Swiss Francs 3.--/kg VOC**

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Exemption and Refund

- Exemption realized through refund of tax, threshold value SFR 3'000. Refunded only for VOCs being used or handled not entering the environment
- Export of VOC
- VOCs which are not emitted into the environment (special case Art. 9 of the Ordinance)
- Mandatory procedures, special case for companies dealing with at least 50 t of VOC/year

Swiss Agency for the Environment, Forests and Landscape SAEFL

Special case

Art. 9 of the Ordinance

- Art. 35a par. 4 of the Swiss Environmental Protection Law: Exemption when VOC emissions being reduced to a greater extent than required by law
- VOC Ordinance: minus 50 per cent below the limit set in the Ordinance on Air Pollution Control exemption until 2008

Swiss Agency for the Environment, Forests and Landscape SAEFL

Special case

Mandatory procedures

- Possible only for companies dealing with at least 50 t VOC/year
- Additional Conditions:
  - Handling or utilising VOC in a way that they do not enter the environment
  - Export
  - Having used at least 1 ton of substances not listed in the Annex and that the process of chemical transformation involved releases $\leq$ 2 % emissions in the air.

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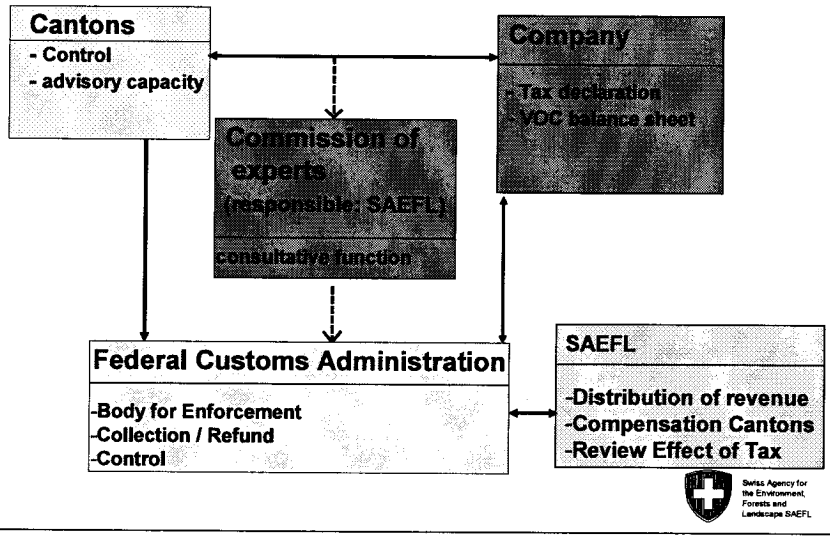
Enforcement of the incentive tax on VOC



Distribution of Revenue

- Revenue: distributed equally between all members of population
  Revenue in 2004: Swiss Francs 124 Mio. SFR
- Distribution through mandatory health insurance (cost effectiveness)
- 2005: Swiss Francs 14.40/person

Swiss Agency for the Environment, Forests and Landscape SAEFL

CASE STUDY - VEHICLE COATING

Manufacturing plant:

Production of trucks (cabins, superstructure and trailers), 4 trucks / d (200 m² / truck, thereof 30% for cabin and 70 % for the rest of the truck (=others) = 200.000 m² / a). 250 working days per year, 16 hours per day.

Coating of the trucks in 2 installations:

1. Coating installation for cabins:
   annual consumption of ~ 24.000 kg coating material (base coat, top coat and clear coat; solvent content ~ 80 – 90 %);
   waste gas: 50.000 m³/h (total volume flow for the coating process and the drying process)
   abatement systems: dust filtration

2. Coating installation for superstructure and trailers:
   annual consumption of ~ 45.000 kg coating material (base coat and top coat, solvent content ~ 80-90 %)
   waste gas: 80.000 m³/h (total volume flow for the coating process and the drying process)
   abatement systems: dust filtration

SMP (solvent management plan)

Situation now

Input:	I/1	base coat cabins	10.000 kg/a (5.000 kg/a VOC)
		base coat others	25.000 kg/a (12.500)
		top coat cabins	8.000 kg/a (4.800)
		top coat others	20.000 kg/a (12.000)
		final coat cabins	6.000 kg/a (4.200)
		Cleaning	2.000 kg/a (2.000)
			40.500 kg/a VOC
	I/2	recovery	3.000 kg/a VOC

Output: O/1 coating installation for cabin (50.000 m³/h):
a) base coat 80 mg/m³ (VOC), 30 % of the time (measuring report 72 mg/m³ organ. C, 90% C - content)
b) top coat 70 mg/m³ (VOC), 30 % of the time (report 56 mg/m³ organ. C, 80 % C)
c) final coat 45 mg/m³ (VOC), 40 % of the time (report 40,5 mg/m³ organ. C, 90 % C)

→ ~ 63 mg/m³ = 50,4 kg/d = 12.600 kg/a

coating installation for others (80.000 m³/h):
a) base coat 90 mg/m³ (VOC), 40 % of the time (report 81 mg/m³ organ. C, 90 %)
b) top coat 60 mg/m³ (VOC), 60 % of the time (report 48 mg/m³ organ. C, 80 %)

→ ~ 72 mg/m³ = ~ 92 kg/d = ~23.000 kg/a

12.600 + 23.000 = 35.600 kg/a (VOC)

O/2, O/3, O/5, O/7, O/8 all 0

O/4 Ventilation of the room (25.000 m³/h), ~ 20 mg/m³
(report 17 mg/m³ organ. C, ~ 85 % C)
8 kg/d = 2.000 kg/a (VOC)

O/6 6.000 kg waste (15 % VOC) = 900 kg/a (VOC)

O/9 others = 2.000 kg/a (VOC)

Solvent consumption (II/1): C = I/1 – O/8 = 40.500 – 0 = 40.500 kg/a (VOC)

Fugitive emissions (II/2): F = I/1 – O/1 – O/5 – O/6 – O/7 – O/8 =
= 40.500 – 35.600 – 0 – 900 – 0 = 4.000 kg/a (VOC)

Emission: E = F + O/1 = 4.000 + 35.600 = 39.600 kg/a

Comparison with the Total Emission Limit Value (TELV):

Emissions / m² of the coated area (according to the SMP)

cabin
~ 13.800 kg/a LM , 60.000 m² = ~ 230 g/m² (TELV 45 g/m²)
others
~ 25.800 kg/a LM, 140.000 m² = ~ 184/m² (TELV 70 g/m²)

Reduction scheme

(according to annex 3, Nr. II "special VOC-installations", of the Austrian VOC-Regulation)

Situation now

2 Coating installations (16 h/d), 250 d/a
- 1 for truck cabins ~ 50.000 m³/h
- 1 for superstructure and trailers ~ 80.000 m³/h
- 4 trucks / d (200 m² / truck) = 200.000 m² / a

input :

base coat others	25.000 kg/a (12.500 VOC, 12.500 S)
top coat others	20.000 kg/a (12.000 VOC, 8.000 S)
base coat cabin	10.000 kg/a (5.000 VOC, 5.000 S)
top coat cabin	8.000 kg/a (4.800 VOC, 3.200 S)
final coat cabin	6.000 kg/a (4.200 VOC, 1.800 S)
cleaning	2.000 kg/a (2.000 VOC)
Σ	40.500 kg/a (VOC), 30.500 kg/a (S)

Annual reference emission (kg): 30.500 x 2.5 = 76.250 kg /a

Target emission: 76.250 x 0,25 = 19.063 kg VOC/a

1st reduction step

a) base coat for the cabin with waterbased paint (10 % VOC)

b) base coat for superstructure and trailers: 50 % of the area will be coated with zinc (melted) and 50 % of the area will be coated with waterbased paint (10 % VOC)

Input:

base coat cabin	10.000 kg/a (1.000 VOC, 5.000 S)
base coat others	12.500 kg/a (1.250 VOC, 5.000 S)
top coat cabin	8.000 kg/a (4.800 VOC, 3.200 S)
top coat others	20.000 kg/a (12.000 VOC, 8.000 S)
final coat cabin	6.000 kg/a (4.200 VOC, 1.800 S)
cleaning	1.300 kg/a (1.300 VOC)
Σ	24.550 kg/a (VOC), 23.000 kg/a (S)

Expected Emission of VOC: 24.550 kg/a

The 1st reduction step is planned to be introduced within 1 year.

2nd reduction step

a) base coat for the cabin with waterbased paint (10 % VOC)

b) base coat for superstructure and trailers: 50 % of the area will be coated with zinc (melted) and 50 % of the area will be coated with waterbased paint (10 % VOC)

c) top coat cabin and others with waterbased paint (10 % VOC)

Input :

base coat cabin	10.000 kg/a (1.000 VOC, 5.000 S)
base coat others	12.500 kg/a (1.250 VOC, 5.000 S)
top coat cabin	8.000 kg/a (800 VOC, 3.200 S)
top coat others	20.000 kg/a (2.000 VOC, 8.000 S)
final coat cabin	6.000 kg/a (4.200 VOC, 1.800 S)
cleaning	500 kg/a (500 VOC)
Σ	9.750 kg/a (VOC), 23.000 kg/a (FS)

Expected Emission of VOC: 9.750 kg/a = below target emission of 19.063 kg/a !

The 2nd reduction step is planned to be introduced within 3 year.

SMP after introduction of the 1st reduction step

a) base coat for the cabin with waterbased varnish (10 % VOC)

b) base coat for superstructure and trailers: 50 % of the area will be coated with zinc (melted) and 50 % of the area will be coated with waterbased varnish (10 % VOC)

Input :	I/1	base coat cabins	10.000 (1.000 VOC)
		base coat others	12.500 (1.250)
		top coat cabins	8.000 (4.800)
		top coat others	20.000 (12.000)
		final coat cabins	6.000 (4.200)
		Cleaning	1.300 (1.300)
			24.550 kg/a
	I/2	recovery	2.500 kg/a
Output:	O/1	coating installation for cabin (50.000 m³/h), ~ 43,5 mg/m³ = 34,8 kg/d = 8.700 kg/a coating installation for others (80.000 m³/h), ~ 60 mg/m³ = 48 kg/d = 12.000 kg/a	
		20.700 kg/a	

O/2, O/3, O/5, O/7 und O/8 = 0

O/4 Ventilation of the room (25.000 m³/h), ~ 15 mg/m³
(report 20 mg/m³ organ. C, ~ 80 % C- content)
6 kg/d = 1.500 kg/a

O/6 5.000 kg waste (15 % VOC) = 750 kg/a

O/9 others = 1.600 kg/a

Solvent consumption: C = I/1 – O/8 = 24.550 kg/a

Fugitive emissions: F = I/1 – O/1 – O/5 – O/6 – O/7 – O/8 = = 24.550 –
20.700 – 0 – 750 – 0 = 3.100 kg/a
(or: F = O/2 + O/3 + O/4 + O/9 = 0 + 0 + 1.500 + 1.600 = 3.100 kg/a)

Emission: E = F + O/1 = 3.100 + 20.700 = 23.800 kg/a (VOC)

SMP after introduction of the 2nd reduction step

a) base coat for the cabin with waterbased varnish (10 % VOC)

b) base coat for superstructure and trailers: 50 % of the area will be coated with zinc (melted) and 50 % of the area will be coated with waterbased varnish (10 % VOC)

c) top coat cabin and others with waterbased varnish (10 % VOC)

Input:	I/1	base coat cabins	10.000	(1.000 VOC)
		base coat others	12.500	(1.250)
		top coat cabins	8.000	(800)
		top coat others	20.000	(2.000)
		final coat cabins	6.000	(4.200)
		Cleaning	500	(500)
			9.750 kg/a	
	I/2	recovery	500 kg/a	

Output: O/1 coating installation for cabin (50.000 m³/h), 22,6 kg/d = 5.650 kg/a

coating installation for others (80.000 m³/h), 12 kg/d = 3.000 kg/a

8.650 kg/a

O/2, O/3, O/5, O/7 und O/8 = 0

O/4 Ventilation of the room (25.000 m^3/h), ~ 7 mg/m^3
(report 6 mg/m^3 organ. C, 85 % C – content)
2,8 kg/d = 700 kg/a

O/6 4.000 kg waste (5 % VOC) = 200 kg/a

O/9 others = 200 kg/a

Solvent consumption: C = I/1 – O/8 = 9.750 - 0 = 9.750 kg/a

Fugitive emissions: F = I/1 – O/1 – O/5 – O/6 – O/7 – O/8 = 9.750 – 8.650 – 0 – 200 – 0 – 0 = 900 kg/a

Emission: E = F + O/1 = 900 + 8.650 = 9.550 kg/a

Total emission: 9.550 kg / 200.000 m^2 = ~ 48 g/m^2

Comparison with the Total Emission Limit Value (TELV):

Emissions / m^2 of the coated area (according to the SMP)

cabins: ~ 5.920 kg/a LM , 60.000 m^2 = ~ 99 g/m^2 (TELV 45 g/m^2)

others: ~ 3.630 kg/a LM, 140.000 m^2 = ~26 g/m^2 (TELV 70 g/m^2)

cabin and trucks (total): 9.550/200.000 = ~ 48 g/m^2 (TELV 70 g/m^2)

CASE STUDY - COATING OF WOODEN SURFACES

Manufacturing plant:

Production of doors, furniture and other articles. They use softwood, hardwood and derived timber products (chipboards, etc.). 250 working days per year, 8 hours per day.

Coating of the products in 2 installations:

1. installation for spray-painting:
   annual consumption of ~ 20.000 kg coating material (mainly clear coat, solvent content ~ 80 %)
   waste gas: 40.000 m³/h for the coating process and 20.000 m³/h for the drying process
   abatement systems: dust filtration

2. installation for roller-painting:
   annual consumption of ~ 10.000 kg coating material (mainly top coat, solvent content ~ 50 %)
   waste gas: 10.000 m³/h during coating process and 10.000 m³/h during drying process
   abatement systems: none

SMP (solvent management plan)

Input:	I/1	clear coat	20.000 kg/a (16.000 kg VOC)
		top coat	10.000 kg/a (5.000)
		Cleaning	3.000 kg/a (3.000)
			24.000 kg/a VOC
	I/2	recovery	2.000 kg/a

Output: O/1 spray-painting:

a) coating 100 mg/m³ VOC (report 70 mg/m³ organ. C, 70 % C)
b) drying ~85 mg/m³ VOC (report 60 mg/m³ organ. C, 70 % C)

→ ~5,7 kg/h = 45,6 kg/d = 11.400 kg/a

roller-painting:

a) coating ~94 mg/m³ VOC (report 75 mg/m³ organ. C, 80 %)
b) drying ~112 mg/m³ (report 90 mg/m³ organ. C, 80 %)

→ ~2,1 kg/h = ~ 16,5 kg/d = 4.120 kg/a

11.400 + 4.120 = 15.520 kg/a VOC

O/2, O/3, O/5, O/7, O/8 all 0

O/4 Ventilation of the painting rooms (25.000 m^3/h), ~ 33 mg/m^3
(report 25 mg/m^3 organ. C, ~ 75 % C)
~6,7 kg/d = 1.675 kg/a

O/6 8.000 kg waste (40 % VOC) = 3.200 kg/a

O/9 others = 2.000 kg/a

Solvent consumption (II/1): C = I/1 – O/8 = 24.000 – 0 = 24.000 kg/a

Fugitive emissions (II/2): F = I/1 – O/1 – O/5 – O/6 – O/7 – O/8 =
= 24.000 – 15.520 – 0 – 3.200 – 0 = 5.280 kg/a (~22%)

Emission: E = F + O/1 = 5.280 + 15.520 = 22.800 kg/a

Questions:

1) Is there a compliance with the Emissions Limit Values of VOC-Directive ?
2) Is there a compliance with the national VOC-regulation in your country ?
3) Are there additional data necessary to answer question 1 or 2 ?
4) In the case of non-compliance:
   a. what has to be undertaken by the company ?
   b. what has to be undertaken by the authority ?
5) Others

Results of the discussions in the working group "Coating"

1) CS - Coating of Wooden Surfaces

Discussions on following items:

- Recycling on site = I/2 or O/8
- Recycling extern = waste O/6, if extern recycled solvent is used again = I/1
- Recycling extern could also be seen as O/8 (recovered for reuse but not input); court decision in SWE (is not in compliance with the opinion of the WG)
- Incineration extern = waste (O/6)
- SMP: for O/1 a measurement report is necessary (measuring during representative conditions)
- GER: 2 different O/1: O/1.1 = captured and treated waste gas
  O/1.2 = captured and untreated waste gas
  Depending on the activity (eg coating) O/1.2 is considered as a fugitive emission
  GER recommends this method as very useful in practice
- ELV dust: only in some countries 3 mg/m³, in others only common requirements
- In some countries additional requirements are listed in other regulations
- The German contribution to this case study is in Annex 8A

Limit Values for new installations:

	VOC Thresholds	ELV	Fugitive LV	Dust LV
A	>5-25 >25	30/75 30/75	25 20	3 3
DK, ESP, EST, FIN, IRL, LUX, LV, LT, MA, PL, RO, SWE	>15-25 >25	100 50/75	25 20	-- --
SK	>0,6-15 >15-25 >25	120 100 50/75	25 25 20	3 3 3
GER	>5-15 >15-25 >25	* 100 20/50	 25 20	- - -

* from 1.1.2013 obligation to applicate a reduction scheme, from 1.11.2007 determination of VOC-emissions by SMP once a year

In this CS only in A and GER measures by the operator are required to be in compliance with the national regulations. In A a simplified Red.-Scheme is a possible solution for the operator (limited content of VOC in the coating materials), in GER only if solvent consumption is >5-15.

Monitoring; Reporting:

In **A** the operator of the plant (company) has to prove the compliance with ELV, etc.
- for the first time during the beginning of operation
- and then all three years
by measurements of organic C (and NOx, CO in the case of afterburning, and dust) by experts in accordance with annex 5 to this regulation (except in the case of continuous measurements).
In plants (companies), in which the annual solvent consumption does not exceed 2 t, in place of these measurements also a computation of the emission concentration is possible, in accordance with annex 5.
VOC-installations, in which the mass flow of VOC (organic C) in the exhaust gas exceeds 10 kg/h, must be equipped with suitable continuous measuring instruments.
A continuous measurement is not necessary, if by another suitable continuous monitoring (eg temperature in the case of catalytic afterburning) or by suitable primary measures it is guaranteed that the ELV for exhaust gases are kept; the suitability must be proven by an experts appraisal.
Once a year the operator must provide a SMP by an expert or by himself, if he possesses the technical knowledge and experiences necessary for the production of the SMP and his past activity guarantees also a conscientious operation.
The operator must convey a copy of the SMP to the authority within three months at expiration of the calendar year. The original of the SMP must to be kept at least three years in the company.

Once a year the operator must prove the compliance with
- limit values for the fugitive emissions
- limit values for the total emission
- requirements for the reduction scheme
on basis of a SMP by an experts appraisal.

In A beginning in 2005 and afterwards all 3 years :
- Report by the operator to the competent authoirity (district authority) using a form, which is part of the national regulation
- Report by the competent authoirity to the head of the province/Bundesland (Landeshauptmann), using a form
- Report by the Landeshauptmann to the ministery by using a form
- Report by the ministery to the EC

In **SK** we have legislation covering the system of proving some requirements as ELV, TELV, continuous monitoring, ... The legislation is similar like in **A** but more complicated, I think full translation of two main ordinances with several annexes would be necessary to grasp all consequences.

Once a year, the operator must provide:
- SMP by an expert or by himself
- Announcement letter of organic solvents user
- Announcement of intend of using reduction scheme

The operator must provide this data to the local authority up to February 15th

2) CS - Vehicle Coating

Discussions on following items:

- Different views in this CS, single VOC-installations or total VOC-emissions ("umbrella solution")
- Different reduction schemes are possible
- In A specified RedScheme is possible, TELV is not o be used anymore
- In GER the TELV can not be used, because solvent consumption is below the threshold for each activity
- In GER for the coating of cabins a specified RedScheme is possible as well as for trailer and superstructure, after finishing the RedScheme = compliance.
- The German contribution to this case study is in Annex 8B

Limit Values for new installations > 15 t VOC/a:

	Thresholds	**ELV (mg/m³)**	**Fugitive LV (%)**	**TELV (g/m²)**
A	>15	Cabins 30/75 Trucks 30/75	25 20	Cabins 45 Trucks 70
DK, ESP, EST, FIN, IRL, LUX, LV, LT, MA, RO, SWE	>15			Cabins 55 Trucks 70
SK	< 5.000 Cabins/a > 5.000 Cabins/a < 2.500 Trucks/a > 2.500 Trucks/a	--	--	65 85 90 70
GER	>15	Cabins 50 Trucks 50 Trailer 50*	-- -- 25	Canins 45 Trucks 70 --
LV	>15	50/75	20	--

* untreated captured waste gas = fugitive emission

Case study: coating of trucks

Situation:

- One operator
- Production of trucks: Cabins, superstructure and trailers
- 2 coating installations:
  a) coating of cabins = installation I
  b) coating of superstructures and trailers = installation II
- No exhaust gas abatement technique
- Solvent content in varnish: ca. 80 - 90%

IMPEL Workshop on VOC:
German point of view to the case study "coating of trucks"

Dr. Richard Schlachta
Bavarian Agency for Environment
Salzburg, 21. – 23.09. 2005

1

Case study: coating of trucks

1. Step: Is a permitting license necessary for the installations?

Consideration as "common" installation:
Yes, solvent consumption > 15 t/a (Nr. 5.1 column 2 of Annex of 4. BImSchV):

Conditions:
- Same working area
- Common operational equipment
- Comparable technical purpose

Consideration as two "stand alone" installations:
a) Cabin coating: No, solvent consumption > 15 t/a
b) Superstructures/Trailers: Yes, solvent consumption > 15 t/a
(Nr. 5.1 column 2 of Annex of 4. BImSchV):

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Case study: coating of trucks

2. Step: Activities according to German VOC Directive (31. BImSchV) for each installation?

↔

Yes.

Installation I: No. 4.2: Serial coating of cabins

Installation II:

a)No. 4.3 Coating of trucks

b)No. 5.1 Coating of trailers

↓

3. Step: Do the activities fall under the scope of 31. BImSchV because of the solvent consumption?

↔

Yes; solvent consumption >> thresholds

Installation I: No. 4.2: 0 t/a

Installation II: a) No. 4.3: 0 t/a

b) No. 5.1: 0 t/a

Remark:

- Cleaning of equipment is considered to the activity in each case

Case study: coating of trucks

Requirements according Annex III Nr. 5.1 of 31. BImSchV:

a) For installation I coating of cabins (if solvent consumption < 15 t/year)

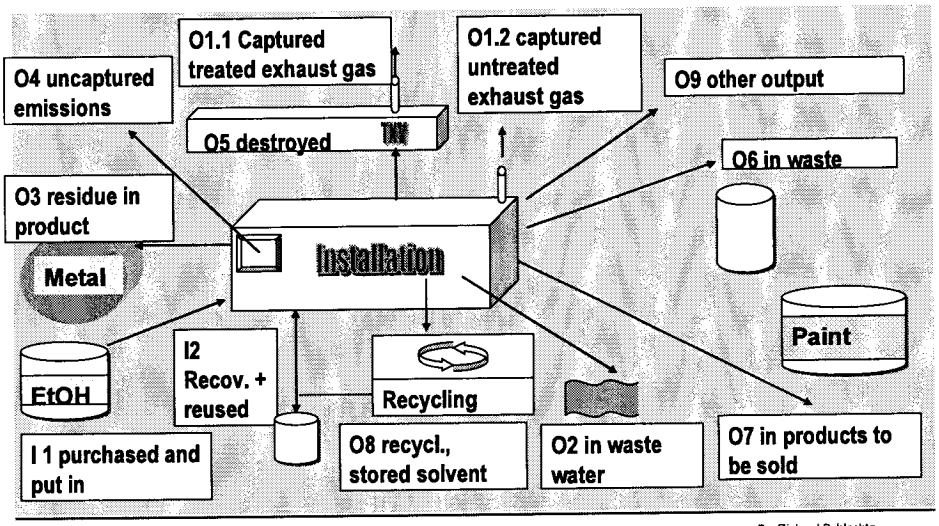
b) For installation II coating of trailers

c) For installation II coating of superstructures (if solvent consumption < 15 t/year

Emission limit value for treated waste gas [mg C/m³]	Emission limit value fugitive emission [% of solvent input]	Special provisions
50 (1)	25 (2)	2) VOC in captured untreated exhaust gas = fugitive emission

1) Proof by 15 minutes average emission measurements

Case study: coating of trucks



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Case study: coating of trucks

Solvent management plan for Installation I:

I1	Purchased solvent and put in	14.700 kg
I2	Recovered and reused solvent in the installation	3.000 kg (solvent recovery??)
O1.1	Captured treated waste gas emissions	0 (air of the hall = fugitive emission)
O1.2	Captured untreated waste gas emissions	0 (air of the hall = fugitive emission)
O2	Solvent in waste water	Here neglected
O3	Solvent in product	Here neglected
O4	Uncaptured emissions	Calculation

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Case study: coating of trucks

Installation I – coating of cabins:

Determination of the solvent consumption:

LV = I1 – O8 = 14.700 kg – 0 kg = 14.700 kg

-> Installation Nr. 4.2 of Annex I of 31. BImSchV

Calculation of the fugitive emissions according Annex V Nr. 2.2.1 b:

F = I1- O1.1 – O5 – O6 – O7 – O8 = 14.700 kg – 0 – 0 – 225 kg – 0 - 0 = 14.475 kg/a

Calculation of the total emissions according Annex V Nr. 2.1.2 b):

E = F + O1.1 = 14.475 kg/a + 0 = 14.475 kg/a

Case study: coating of trucks

Alternatives: Installation of an exhaust gas abatement unit or using a reduction scheme

Reduction scheme according to Annex IV section B for installation I (coating of cabins):

Reference emissions: 10.000 kg solids/year * 2,5 (Multiplication factor) = 25.000 kg/year

Target emission = Reference emission * percentage = 25.000 kg/year * (25 + 15)% = 10.000 kg/year

Following total emissions may not be exceeded:

- from 01.11.2005: Target emission * 1,5 = 15.000 kg/year
- from 01.11.2007: Target emission = 10.000 kg/year

Result:

Emission reduction measures are necessary to comply to the target emission! In comparison: current total emissions 14.475 kg/year

Case study: coating of trucks

Installation I: Possible emission reduction measures: Step 2

- Base coat for the cabin with waterbased varnish (10% VOC)
- Top coat cabin with waterbased varnish (10% VOC)

Consumption data after VOC reduction

Material	Consumption [kg]	VOC-content [%]	[kg]	Content of solids [%]	[kg]
Base coat	10.000	10	1.000	0	5.000
Top-coat	8.000	10	800		3.200
Final coat	6.000		4.200		1.800
Cleaning solvents (500 kg *0,35)	175	100	175	0	0
Total			*6.175*		*10.000*

Case study: coating of trucks

Installation I: Reduction step 2:

Determination of the solvent consumption:

LV = I1 – O8 = 6.715 kg – 0 kg = 6.714 kg

-> Installation Nr. 4.2 of Annex I of 31. BImSchV

Calculation of the fugitive emissions according Annex V Nr. 2.2.1 b:

F = I1- O1.1 – O5 – O6 – O7 – O8 = 6.715 kg – 0 – 0 – 200:4 kg – 0 - 0 = 6.665 kg/a

Calculation of the total emissions according Annex V Nr. 2.1.2 b):

E = F + O1.1 = 6.665 kg/a + 0 = 6.665 kg/a

Case study: coating of trucks

Installation II: Coating of trailers and superstructure

Material	*Consump-tion [kg]*	*VOC-content [%]*	*[kg]*	*Content solids [%]*	*[kg]*
Manual operated cleaning	1.300	100	1.300	0	0
Base-coat	25.000	50	12.500	50	5.000
Top-coat	20.000	60	12.000	40	3.200
Total			*25.800*		*8.200*

Attention:
In installation II two activities (No. 5.1 and 4.3) are practiced; the solvent consumption must be differentiated for each activity!
From reasons of simplification a ratio 1:1 according to superstructure : trailer is assumed -->Solvent consumption for each activity < 15 t/year
a) Trailer coating: -> requirements according to No. 5.1 have to be complied
b) Superstructure: Because solvent consumption is < 15 t/year -> requirements relating to 5.1 have to be applied

Case study: coating of trucks

Solvent management plan for Installation II:

I1	Purchased solvent and put in	25.800 kg
I2	Recovered and reused solvent in the installation	0 (solvent recovery??)
O1.1	Captured treated waste gas emissions	0 (air of the hall = fugitive emission)
O1.2	Captured untreated waste gas emissions	0 (air of the hall = fugitive emission)
O2	Solvent in waste water	Here neglected
O3	Solvent in product	Here neglected
O4	Uncaptured emissions	Calculation

Case study: coating of trucks

Installation II: Coating of trailers + superstructures:

Determination of the solvent consumption:

LV = I1 – O8 = 25.800 kg – 0 kg = 25.800 kg

-> Installation No. 4.3 and No. 5.1 of Annex I of 31. BImSchV

Calculation of the fugitive emissions according Annex V Nr. 2.2.1 b:

F = I1- O1.1 – O5 – O6 – O7 – O8 = 25.800 kg – 0 – 0 – 675 kg – 0 - 0 = 25.125 kg/a

Calculation of the total emissions according Annex V Nr. 2.1.2 b):

E = F + O1.1 = 25.125 kg/a + 0 = 25.125 kg/a

Case study: coating of trucks

Installation II: Possible emission reduction measures:

- Base coat for superstructure and trailers: 50% of the area will be coated with zinc and 50% of the area will be coated with waterbased varnish
- Top coat with waterbased varnish

Consumption data after VOC reduction, installation II: Step 2

Material	*Consumption [kg]*	*VOC-content [%]*	*[kg]*	*Content of solids [%]*	*[kg]*
Base coat	12.500	10	1.250	40	5.000
Top coat	20.000	10	2.000	40	8.000
Cleaning	325	100	325	0	0
Total			*3.575*		*13.000*

Case study: coating of trucks

Installation II, reduction step 2: Reduction scheme according to Annex IV section B:

Reference emission: 13.000 kg solids/year * 2,5 (Multiplication factor) = 32.500 kg/year

Target emission = Reference emission * percentage = 32.500 kg/y * (25 + 15)% = 13.000 kg/year

Following total emissions may not be exceeded (existing installation):

- From 01.11.2005: Target emission * 1,5 = 19.500 kg/year
- From 01.11.2007: Target emission = 13.000 kg/year

Result:

Reduction scheme comply to the requirements of 31. BImSchV: Actual total emissions (3.575 – 550 (O6)= 3.025 kg/year) ≤ target emissions!

Case study: coating of trucks

- Qualified operational documentation necessary over type and quantity of inputs with VOC content value; deposition of these documents near the installation at least 5 years
- The VOC content limits relate to the individual useable coating material (no sum parameter or average over all coating materials)

Case study: coating of trucks

Simplified verification for installations No 4.1 – 4.5, 5.1 or 8.1 without needing a permitting licence:

a) Exclusive coatings with VOC content value ≤ 250 g/l

and

b) Exclusive cleaners with a mass content of < 20 weight%

Case study: coating of trucks

Activity No 5.1: Maximum VOC content limit values for vehicle refinishing products

Product	VOC [g/l]	Product	VOC [g/l]
Gun wash	850	Grinding filler	540 (1)
Pre-cleaner	200	Wet-in-wet filler	540 (2)
Bodyfillers/stoppers	250	One layer uni top coat	420
Wash primer	780	Basic top coat	420
Haftgrundierung	540 (1)	Clear coat	420 (3)
Grundierfüller	540 (1)	Special finishes	840 (3) (4)

1) From 01.01.10: <250; 2) from 01.01.10: <420; 3) from 01.01.10 adaption to the best available techniques; 4) proportion special finishes: =< 10 %

Case study: coating of trucks

Results:

Case a) "common" installation (permitting license necessary):

- For activity No. 5.1 coating of trailers a reduction scheme according to section B or a simplified verification scheme is possible to apply

-For activity No. 4.2 coating of cabins a reduction scheme according to section B is possible to apply but not a simplified verification scheme

-For activity No. 4.3 coating of superstructure a reduction scheme according to section B is possible to apply but not a simplified verification scheme

Case b) "stand alone" installations:

- Installation I coating of cabins: A reduction scheme according to section B can be applied or a simplified verification scheme (Annex IV, section C No.2; because solvent consumption < 15 t/year)

- Installation II: A reduction scheme according to section B can be applied (if solvent consumption for activities No. 5.1 < 15 t/y and No. 4.3 < 15 t/y)

Case study: coating of trucks

In Germany: Application of reduction schemes for installations needing an authorisation: The principle of precaution has to be considered (§ 4 sentence 3 of 31. BImSchV):

- The reduction scheme regulates only the max. annual total emission fright.

  -> But: Harmful effects on environment are possible by higher actual emission mass concentrations or mass flows although the installation complies to the reduction scheme (e.g. by relevant odours)

- Therefore:
  Additionally to the reduction scheme:-> fixation of emission limits for captured waste gas sources of installations needing an authorisation!

Case study: coating of trucks

Conclusions for case study: truck coating:

Case a): Coating installations are "common" installations needing a permitting license:

All stacks of the two installations have to comply to an emission mass concentration of 50 mg C/m^3

Case b): Two stand alone installations where coating of trailers and superstructure need a permitting license:

- For installation I coating of cabins a reduction scheme according to section B is possible without additional emission limits for the waste gas (no license necessary because of solvent consumption < 15 t/y)
- For installation II a reduction scheme according to section B is possible with additional emission limits for the waste gas (50 mg C/m^3) (license necessary because of solvent consumption > 15 t/y)

Case study: coating of trucks

BAT on metal coating: **Source: DIFU 2003**

1. **Surface cleaning of the products by using alkaline water-based cleaning agents**
2. **Usage of low emission or emission free coatings:**

- Waterborne coatings
  Powder coatings
- High Solids

For coating of a larger number of parts without change of colour:
Electrophoretic dipping (ETL) for grounding with water based coatings + top coating with powder or High Solids

For metal furniture: water based coatings

3. **Paint application systems with improved efficiency**

Case study: coating of trucks

Achievable application efficiencies for metal coating

Technology	Efficiency [%]	Suitable coating systems	Geometry of the work piece	Limitations
Compressed air spraying	20 – 65	1 K, 2 K	No limitation	-
Airless	40 – 75	1 K, 2 K	Big, simple	-
Air mix	35 – 75	1 K, 2 K	Big, simple	-
HVLP	40 – 80	1 K, 2 K	No limitation	-
Electrostatic assisted compressed air spraying	50 – 80	1 K, 2 K	No faraday cage	Electrically conductivity necessary
Electrostatic assisted Airless spraying	45 – 85	1 K, 2 K	No faraday cage	Electrically conductivity necessary

2 K = 2 component systems with hardner

Sources: Corley (1991), BREF Draft 2004

Case study: coating of trucks

Technique	Efficiency [%]	Suitable coating systems	Geometry of the work piece	Limitations
Rolling	100	1 K	Flat, sheet-like	-
Casting	100	1 K	Flat, sheet-like	-
Flooding	95 – 99	1 K	Non-scooping	High solvent losses
Dipping	80 – 90	1 K	Non-scooping	High solvent losses
Powder with electrostatic spraying	50 – 95	Powder	No limitations	Electrically conducting and temperature resistance materials necessary

Sources: Corley (1991), BREF Draft 2004

Case study: coating of trucks

Other possibilities of VOC emission reduction for coating:

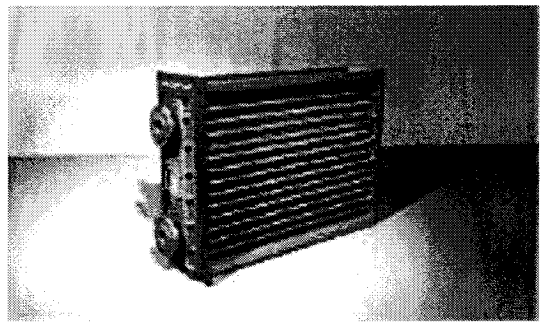
- Abandonment of intermediate coating steps
- Optimization of existing drying systems e.g. by change of the time of drying, temperature, alignement of the work pieces
- Utilization of closed cleaning systems (minimization of fugitive emissions)
- Utilization of low emission cleaning agents
- Application of closed filling and drainage systems (application of gas balance technique)
- Container with solvents should be kept closed while transport or storage
- Mixing room: mixing container should be kept closed

Working Group
Surface Cleaning

CASE STUDY
SURFACE CLEANING

Manufactoring plant:

2.800.000 heat exchanger per year with 3/8´´- tubes used in air conditioner



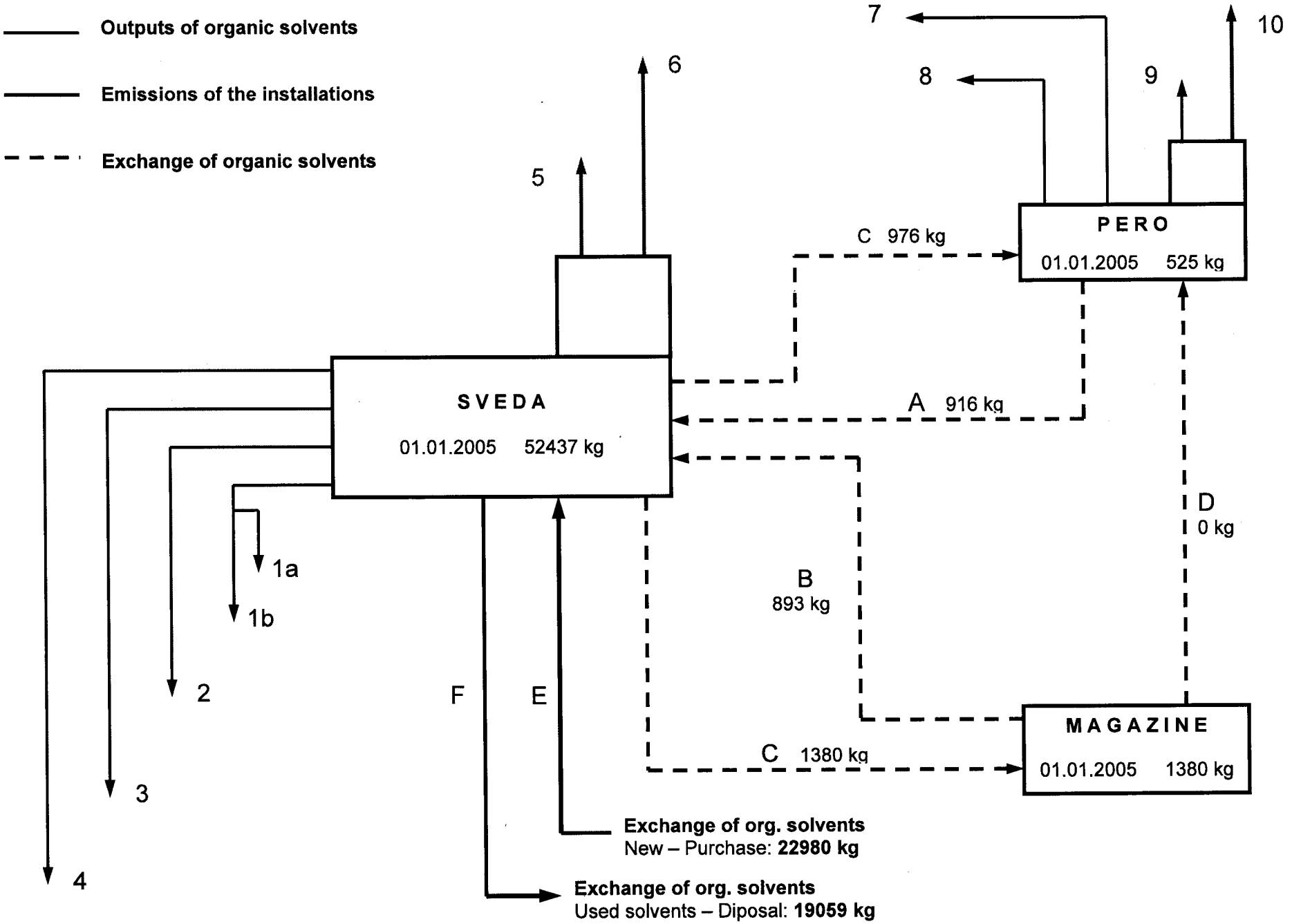
Cleaning /degreasing of heat exchanger with organic solvent (tetrachlorethen) in 2 installations:

1. SVEDA (52437 kg Tetrachlorethen) – Vacuum degreasing chamber (< 700 mbar) for heat exchanger, distillation and activated carbon filter

2. PERO (525 kg Tetrachlorethen) – small, self-contained installation for tubes only

Questions:

1) Does the installation comply with the Emissions Limit Values of VOC-Directive ?
2) What has to be clarified to answer question 1 (which additional data are needed) ?
3) In the case of non-compliance:
    a. what has to be undertaken by the company ?
    b. what has to be undertaken by the authority ?


Outputs of organic solvents
Emissions of the installations
Exchange of organic solvents
7
10
6
8
9
5
PERO
01.01.2005 525 kg
C 976 kg
SVEDA
01.01.2005 52437 kg
A 916 kg
D
0 kg
1a
1b
B
893 kg
2
F
E
MAGAZINE
01.01.2005 1380 kg
C 1380 kg
3
4
Exchange of org. solvents
New – Purchase: 22980 kg
Exchange of org. solvents
Used solvents – Diposal: 19059 kg

Balance from the org. solvent Tetrachlorethen in the year 2004

Pos.	SVEDA-INSTALLATION	Liter:	kg.:
	Quantity of organic solvents January 2004	30,641	49,761
A	`+ Org. solvents from the PERO-Installation	564	916
B	`+ Refill of org. solvents from the magazine	550	893
E	`+ Exchange of organic solvents - new	14,150	22,980
F	`- Exchange of organic solvents - used	11,736	19,059
C	`- org. solvents from this installation to the magazine or the PERO-Installation	1,451	2,356
1a	`- org. solvents contained in waste (≤ 0,5%) 17.590 kg	54	88
1b	`- org. solvents contained in waste (> 0,5%) 0 kg	0	0
2	`- output of org. solvents by changing strainers, 0,5 kg /time and 212 times	65	106
3	`- output of org. solvents by analysis (1 l / month)	12	19
4	`- output of organic solvents by repair and service	100	162
5	`- Emission of org. solvents in waste gases (7mg/m³ *x 3700m³/h)*	7	11
6	`- output of org. solvents by the cleaned products	191	310
	`= Quantity of organic solvents January 2005	32,289	52,437

Pos.	PERO-INSTALLATION		
	Quantity of organic solvents January 2004	341	554
C,D	`+ Refill of org. solvents from the magazine or the SVEDA-Installation	601	976
A	`- org. solvents from this installation to SVEDA-Installation	564	916
7	`- output of org. solvents by changing strainers	22	36
8	`- output of organic solvents by repair and service	0	0
9	`- output of org. solvents by waste activated carbon	10	16
10	`- output of org. solvents by the cleaned tubes	23	37
	`= Quantity of organic solvents January 2005	323	525

MAGAZINE		
Quantity of organic solvents January 2004	550	893
`+ org. solvents from the SVEDA-Installation	850	1,380
`- Refill of org. solvents to the SVEDA-Installation	550	893
`- Refill of org. solvents to the magazine PERO-Installation	0	0
`= Quantity of organic solvents January 2005	850	1,380

Total quantity of organic solvents January 2004	31,532	51,208
Total quantity of organic solvents January 2005	33,462	54,342

Difference of org. solvents 2004 - 2005 :	1,930	3,134
Exchange of org. solvents (new 14.150 l - old 11.736 l ==> 2.414 l)	2,414	3,920
Diposal of org. solvents (total positions 1a,1b,2,3,4,7,8,9)	263	427
Emissions of the installations (total positions 5,6,10)	221	359