LEATHER COATING

SYNOPSIS SHEET

Prepared in the framework of EGTEI

1. Activity description and EGTEI contribution - summary

The production process in a tannery can be split into four main categories: hide and skin storage and beam house operation, tanyard operations, post-tanning operations and finishing operations.

This activity emits VOC originating from the finishing process. Finishing operations include several mechanical treatments as well as the application of a surface coat. The selection of finishing processes depends on the specifications of the final product. Water-based systems are increasingly favoured.

At a EU25 level, in 2000 (according to RAINS: version CP_CLE_Aug04(Nov04)), NMVOC emissions were 12.1 kt representing 0.11% of total NMVOC emissions. Total activity being, 13.2 kt of coatings used, average emission factor is about 0.92 kg NMVOC/kg of coatings. It means that emissions from this sector are already partly treated in EU25 (unabated emission factor being 1.02 kg/kg). These data might be modified in a near future by national experts during bilateral consultations in 2005 with CIAM.

The coating of leather is addressed by the European Directive 1999/13/EC (SED) [1] related to the reduction of NMVOC emissions from the use of solvents in some industrial activities. In order to be able to better represent the impact of this Directive in term of emission reduction and costs, **this sector has been considered as an individual activity by EGTEI [2]**. This sector was not considered separately in the previous RAINS version [3]. It was part of "Industrial Use of Paints in Other Industrial Use of Paints" (sector gathering ship building industry, manufacture of plastic and metal articles, wood products industry and other applications of paints). Thus, emission factors, abatement techniques and costs defined were not specific to this sector.

EGTEI has been able to develop a specific approach for representing this sector and estimate costs of reduction techniques. The methodology for this sector was developed in cooperation with the Italian association of the leather industry (UNIC) [4] as they have been working on the preparation of the Directive.

Presently, RAINS has been modified and integrates EGTEI proposals. **Data provided by EGTEI (emission factors and costs) have been implemented in the new RAINS version of the model [5] for the modelling work carried out in the scope of the CAFÉ programme.**

The representative unit used is the amount of coatings consumed annually (kt/year). This unit is more representative than the surface of leather coated as emissions/m² can vary dramatically from one installation to another. Only one reference installation (RI) is defined to facilitate the national expert work.

Two primary measures are considered based on different types of coatings: solvent-based and water-based. Solvent-based coatings are commonly used and represent the unabated situation. Water-based coatings can be used to a large extent and allow installations being in compliance with the SED requirements.

Thermal oxidation and biofiltration are considered as secondary measures for this sector to be in compliance with the SED requirements. One or the other can be used but biofiltration is cheaper.

EGTEI provides default emission factors (EF) with abatement efficiencies, investments and variable and fixed operating costs (OC) as well as unit costs (€/t NMVOC abated and €/activity unit) for all the combinations of measures.

The use of water-based coatings does not lead to higher costs according to [4]. Its use is only limited by technical constraint for certain types of leather. When this measure is not applicable, secondary measures have to be installed to comply with the SED requirements. Biofiltration seems to be more adapted to this sector (in terms of unit costs) than the use of thermal oxidiser.

National experts have to collect 3 country specific parameters (wages, electricity and natural gas costs) which can be very easily known. EGTEI provides default costs which can be used if no better data exist. National experts have also to provide the trends in activity level from 2000 to 2020 as well as the application and applicability rates of each abatement technique.

As the representation of this sector in RAINS is based on the EGTEI proposal, it is recommended to national experts to complete ECODAT with country specific parameters which are not known from CIAM.

EGTEI proposals for the representation of this sector and definitions of abatement techniques have been considered in the last update of RAINS [5]. In the future however, new technical improvements should be introduced in the EGTEI background document to continuously improve the representation of this sector.

2. European regulation

As mentioned above, the European Directive 99/13/EC [2] applies to this sector (annex IIA, n°13).

Directive applies to installations with a solvent consumption above 10 t per year. Emission limit values defined in the Directive are presented in table 2.1. All obligations are not described in this chapter.

Table 2.1: Emission limit values

Solvent consumption threshold [t / year]	Total emissions [g VOC / m² of leather produced]
10 - 25	85
> 25	75
> 10 *	150

* For leather used in furnishing, or for small products such as bags, belts, wallets…

The compliance date for existing installations is October 30th, 2007. Following the transcription of the Directive in Member States, this date can be different from country to country. For example, in France, the compliance date is October 30th, 2005.

3. Methodology developed within EGTEI to represent the sector

3.1 Definition of the reference installation

As this sector is very poorly known, only one medium reference installation (RI) is considered (as emission factors expressed in g VOC/m² differ significantly from one installation to another, the reference installation is defined according to the quantity of coatings consumed). This approach gives more flexibility to national experts.

Table 3.1.1: Reference installation

Reference Installation Code RIC	Description	Technical characteristics
01	Medium installation: 40 tonnes of coatings/y	Full load hours: 1,840 h/y [VOC]: 1.5 g/m^3 Flow rate: 13,300 m^3/h Solvent consumption: 40.8 t/y

3.2 Definition of emission abatement techniques

3.2.1 Primary measures

Two primary measures are defined according to the type of paints used. Water-based systems are increasingly favoured because of environmental concerns about organic solvents and in order to comply with regulations. Base-coats are generally water-based. If very high standards of topcoat are required, solvent-based systems cannot always be substituted by aqueous-based systems. Average solvent contents of the paints are shown in table 3.2.1.1.

Table 3.2.1.1: Primary measures

Primary Measure Code PMC	Description
00	Use of solvent-based products (85 wt. % solvent content)
01	Use of water-based products (30 wt. % solvent content)

3.2.2 Secondary measures

Two secondary measures are considered below. As thermal oxidisers might be too expensive for small tanneries, biological treatment can be an alternative. Both are defined in table 3.2.2.1.

Table 3.2.2.1: Secondary measures

Secondary Measure Code SMC	Description
00	No secondary measure
01	Thermal oxidation
02	Biofiltration

4. Country specific data to be collected

Different types of country specific data have to be collected to give a clear picture of the situation in each Party. EGTEI proposes default values for the economical parameters which can be modified by the national expert if better data are available.

For this activity as for all NMVOC sectors, country specific economical parameters are used to calculate variable operating costs. They are presented in table 4.1 as the default costs proposed by EGTEI (these costs are entered only once in ECODAT).

Table 4.1: Country specific costs

Parameters	Default costs provided by EGTEI	Country specific costs
Electricity [€/kWh] (net of taxes)	0.0686	To be provided by national experts
Natural gas [€/GJ] (net of taxes)	5.926	To be provided by national experts
Wages [€/h]	25.9	To be provided by national experts

Default data have been used to calculate variable and annual abatement costs presented in table 5.1.

Information concerning activity levels from 2000 to 2020 as well as the description of the control strategy is also necessary (these data can be directly entered in the database ECODAT). A full definition of the work to be done by national experts is provided in the general EGTEI methodology [6].

National experts can also modify the default unabated emission factor proposed by EGTEI to represent the reference situation for all Parties, in a range of ± 10%. If the modification is higher than 10%, then appropriate explanations are required.

Table 4.2: Unabated emission factor [g of NMVOC / kg coating]

Default emission factor	User specific emission factor
1,020	To be provided by national expert

5. Default emission factors and cost data defined with the EGTEI methodology

Table 5.1 gives an overview of all data provided by EGTEI for this sector: default emission factors (EF) with abatement efficiencies, investments, and variable and fixed operating costs (OC) as well as unit costs per t NMVOC abated and per unit of activity.

Variable costs account for electricity, natural gas, steam and labour if a secondary measure is used. No variable cost is considered for primary measures as water-based coatings are not more expensive than solvent-based ones.

Fixed operating costs are only considered for secondary measures and correspond to 5% of the secondary measure investment (for maintenance and insurance). As no economic data is available, it is assumed that fixed operating costs are the same for all primary measures so no additional costs are taken into account (that is why fixed operating costs appear as 0 costs in table 5.1).

Investments and variable operating costs of secondary measures presented in table 5.1 are calculated from the equations defined in the documents “derivation of secondary measure costs: thermal

oxidation" [7] and "derivation of secondary measure costs: biofiltration" [8]. Technical characteristics of the installations are given in table 3.1.1.

Table 5.1: Default emission factors (EF), abatement efficiencies and costs for each combination

RIC PMC SMC	NMVOC EF [g VOC / kg coating]	Abatement efficiency [%]	Investment [k€]	Variable OC [k€ / year]	Fixed OC [k€/y]	Unit cost [€/t VOC abated]	Unit cost [€/t of coating]
01 00 00	1,020	0	0	0	-	-	0
01 00 01	190	81.4	600	10.65	30.0	3,453	2,866
01 00 02	190	81.4	170	8.0	8.5	1,128	937
01 01 00	360	64.7	0	0	-	0	0

Unit costs [€/t of NMVOC abated] are obtained by dividing the annual total additional cost of a measure by the amount of NMVOC abated (costs and emissions are compared to the uncontrolled measure PMC 00/SMC 00).

As shown in table 5.1, the use of water-based coatings whenever it is feasible is costless. As this option is not always technically available, biofiltration seems to be the most effective technique for this sector (unit costs are three times lower than for the thermal oxidation).

6. Relevance of EGTEI information for Integrated Assessment Modelling (IAM)

In the previous RAINS version [3], leather coating was not studied as a separate sector. It was considered as part of "Industrial Use of Paints in Other Industrial Use of Paints" (sector gathering both ship building industry, manufacture of plastic and metal articles, wood products industry and other applications of paints). Thus, emission factors, abatement techniques and costs considered were not specific to this sector and it was very difficult to define a reduction scenario. That is why this sector was identified as a priority sector at the beginning of the work.

EGTEI provides now an approach to consider this sector and to test the impact of the current legislation.

Data provided in the EGTEI approach (emission factors and costs) have been implemented in the new RAINS version [5] for the modelling work carried out in the scope of the CAFÉ programme and the revision of the Gothenburg protocol.

There is only one concern with the water-based paint option costs: as the model does not like "0" as a cost, this figure will have to be slightly modified in RAINS.

7. Perspective for the future

In the future, any new technology which could be developed, as new types of paints, should be considered by EGTEI in the background document to continuously improve the representation of the sector.

8. Bibliography

[1] 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.
[2] EGEI background document. http://citepa.org/forums/egtei/leather_coating_260603.pdf
[3] KLIMONT; M. AMANN; J. COFALA. Estimating costs for Controlling Emissions of Volatile Organic Compounds (NMVOC) from Stationary Sources in Europe. Interim Report IR-00-51. IIASA. August 1. 2000. http://www.iiasa.ac.at/~rains/voc_review/voc_ir-00-51.pdf
[4] Communication from UNIC: Italian association of the leather industry. May 2003. http://www.unic.it.
[5] Review of data used in RAINS-VOC model http://www.iiasa.ac.at/web-apps/tap/RainsWeb/
[6] Methodology [to be completed]
[7] http://citepa.org/forums/egtei/thermal_oxidation_costs_170603.pdf
[8] http://citepa.org/forums/egtei/biofiltration_costs_170603.pdf
[9] CITEPA: National reference centre for emission inventories

ANNEXE: Example of data collection and use of EGTEI data – Case of France

A. Country specific data collection and scenario CLE developed

The French national expert has been able to complete ECODAT for the coating of leather with the help of CITEPA [9].

All data have been provided to CIAM for the bilateral consultation France – CIAM in March 2004.

Country specific economic parameters

Country specific parameter costs have been defined from costs encountered in the medium size industry which are monthly published by official French statistic organisations.

Table A.1: French specific costs

Parameters	French specific costs
Electricity [€/kWh] (net of taxes)	0.05
Natural gas [€/GJ] (net of taxes)	5.33
Wages [€/h]	23.4

Activity level

As this sector is not specifically studied in the French inventory (it is taken into account with the general use of paints), VOC emissions are not specifically defined. They were estimated by the French leather technical centre (CTC) for the year 2000 at 1,650 tonnes. Activity level in 2000 has been estimated from these emissions.

The activity trend from 2000 to 2020 comes from a treatment of the added value for the branch "leather". It corresponds to an activity decrease of -1.37% from 2000 to 2020.

Table A.2: Activity levels from 2000 to 2020 (t / year)

RIC	2000	2005	2010	2015	2020
01	2,950	2,750	2,570	2,400	2,240

Unabated emission factor

Default emission factors are adapted to the French situation.

Current legislation control scenario (CLE)

In the current legislation control scenario (CLE), the application rates of the different abatement techniques depend on the regulation implemented and on the compliance dates.

The use of water-based coatings in 2000 is assumed to represent 70% of total coatings. No secondary measure is used. In a 1999 French report concerning the implementation of the SED Directive, it is assumed that 21% of solvents are used in installations under the Directive threshold. This corresponds to 6.2% of the activity. From 2005 onwards, installations will have to be in compliance with the SED Directive: 6.2% of the activity is not concerned. The use of water-based paints is assumed to increase regularly and some secondary measures will have to be installed where water-based coatings are not technically available.

The application rates and applicability factors for the CLE scenario are presented in table A.3.

Table A.3: Definition of the CLE scenario

RIC PMC SMC	Application rate in 2000 [%]	Application rate in 2005 [%]	Appl. [%]	Application rate in 2010 [%]	Appl. [%]	Application rate in 2015 [%]	Appl. [%]	Application rate in 2020 [%]	Appl. [%]
01 00 00	30	6.2	100	5	100	4	100	3	100
01 00 01	0	0	100	0	100	0	100	0	100
01 00 02	0	11.9	100	11.9	100	11.9	100	11.9	100
01 01 00	70	81.9	81.9	83.1	83.1	84.1	84.1	85.1	85.1
Total RIC 01	**100**	**100**	**-**	**100**	**-**	**100**	**-**	**100**	**-**

B. Trends in emissions and total costs of the CLE scenario

Data shown in the table below are directly provided by ECODAT and based on input parameters defined in chapter A.

Table B.1 presents NMVOC emissions from 2000 to 2020 and total annual costs of emissions reduction for the CLE scenario.

Table B.1: Trends in emissions and total annual costs of emission reductions in the CLE scenario

	2000	2005	2010	2015	2020
NMVOC emissions	**t NMVOC**	**t NMVOC**	**t NMVOC**	**t NMVOC**	**t NMVOC**
CLE scenario	1,646	1,047	958	879	805
Annual total costs	**M€/year**	**M€/year**	**M€/year**	**M€/year**	**M€/year**
CLE scenario	0.00	0.31	0.29	0.27	0.25