INDUSTRIAL APPLICATIONS OF PAINTS

SYNOPSIS SHEET

Prepared in the framework of EGTEI

1. Activity description and EGTEI contribution - summary

Many activities are concerned by the industrial application of paints. The BCF (British Coating Federation [1]) considers the following sub-sectors: automotive OEM (original equipment manufacturers) bodies, automotive OEM components (primarily plastic automotive components), vehicle refinishing, marine/offshore, high performance (protective, fire protection, anti-corrosion coatings), rigid metal packaging (food, beer and beverage and general cans), coil coating, drum, furniture/joinery, aerospace, ACE (Agricultural, Construction and similar Equipment), general Industry - trade coaters, general Industry – general engineering, general Industry – industrial equipment, general Industry – metal furniture, general Industry – original equipment, general Industry – heavy engineering, general Industry – plastics (other than those for automobiles), general Industry – powder.

Some of these sectors are already studied in other EGTEI documents. This synopsis sheet treats three sub-sectors:

- General industry: trade coaters, general engineering, industrial equipment, original equipment, heavy engineering and ACE (aerospace can also be considered here),

- Continuous processes: furniture, rigid metal packaging and drums,

- Plastic coating: plastic and automotive OEM components.

Marine/offshore and high performance paints are studied in another EGTEI document but no measure has been defined for these sectors. In RAINS [2], these paints are currently considered with the general industry. This issue is discussed with CIAM and representatives from the European industry to determine if it should be studied separately with specific abatement techniques and costs.

This activity emits NMVOC originating from the use of paints containing solvents, thinners and cleaning solvents. NMVOC emissions from this sector may vary significantly from country to country. At a EU25 level for the year 2000 (according to the RAINS model [2]: version CP_CLE_Aug04(Nov04)), NMVOC emissions were 543.8 kt representing 5.9% of total NMVOC emissions. Total activity being 1,601 kt of paints used, average emission factor is about 339.6 g NMVOC/kg paint consumed meaning that emissions from this sector are already partly treated in EU25 (unabated emission factors range between 690 and 750 g/kg of paint according to the sub-sector). These estimations could be modified in a near future due to new information provided by national experts during the bilateral consultation in 2005.

The use of coatings in industry is addressed by the European Directive 1999/13/EC (SED) [3] 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 terms of emission reduction and costs, **this sector has been considered as an individual activity by EGTEI [4]**. This sector was defined separately in the previous RAINS version [5]: “other industrial use of paints”. Good housekeeping with better application efficiencies, substitution and end-of-pipe were considered to reduce VOC emissions. As said previously, substrate to be coated and techniques are so different that **EGTEI has developed an approach with three sub-sectors (as defined above) for representing this activity and estimating reduction technique costs**. The methodology was developed in close cooperation with the BCF [1].

Data provided by EGTEI (emission factors and costs) have been implemented in the new RAINS version for the modelling work carried out in the scope of the CAFÉ programme and the revision of the Gothenburg Protocol and national emission ceiling Directive.

The representative unit used is the amount of paint consumed annually (kt/year). Only one reference installation is defined for the general industry and for continuous processes. Two sizes are considered for the plastic coating because the automotive industry is very different from the rest.

Different primary measures are defined based on different types of paints: solvent-based coatings (several types are defined), water-based coatings and powder. Application efficiencies are also part of the primary measure definitions. Solvent-based paints are commonly used and represent the reference situation. These paints evolve with time so different types with different solvent contents and average application efficiencies are defined. Water-based paints can be used to be in compliance with the SED requirements according to the reduction scheme definition (annexe IIB of the Directive). The use of powder coatings is also increasing with the development for new markets. It enables higher VOC reduction than required by the SED.

Thermal oxidation is the unique secondary measure presented for this sector as solvents used are very divers. Its use allows installations being in compliance with the SED requirements.

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 the three sub-sectors.

The use of a thermal oxidiser associated with solvent-based paints is the most expensive option (from 14.1 to 17.8 k€/t NMVOC abated for small installations and 1.6 k€/t of NMVOC abated for the large one). Unit costs for substitution paints are very often negative because fewer products are used to do the same job (this is a combination of higher dry matter in the paints and higher application efficiencies). Some installations will only use improved solvent-based paints to reduce their solvent consumption bellow the Directive solvent consumption threshold (5 tonnes of solvent/year).

For each sub-sector, national experts have to collect 3 country specific parameters (wages, electricity and natural gas costs) and country and sector specific parameters (costs of different types of paints and cleaning solvents). The first ones can be very easily known. The second ones can be defined with the help of national coating associations. EGTEI provides default costs for country and specific parameters which can be used if no better national data exist. National experts have also to provide the trends in activity levels from 2000 to 2020, the activity shares according to the different RI (only for plastic coating) as well as the application and applicability rates of each abatement technique.

As the representation of this sector in RAINS [2] is now based on the EGTEI proposal, it is recommended to national experts to complete ECODAT with country specific parameters which are not known from CIAM.

In the future however, 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 sector representation. A review of costs should also be done.

2. European regulation

As mentioned above, the European Directive 99/13/EC [3] applies to this sector (annex IIA, n°8).

Operators can conform to the Directive in either of the following ways:

by complying with the canalised and fugitive emission limit values,

by introducing a reduction scheme to obtain an equivalent emission level (in particular by replacing conventional products with a high solvent content with low-solvent or solvent-free products).

The SED applies to installations with a solvent consumption above 5 t per year. Emission limit values defined in the SED are presented in table 2.1. All obligations are not described in this chapter.

Table 2.1: Emission limit values for other coating

Solvent consumption threshold [t / y]	NMVOC emission limit value in residual gases [mg C / Nm^3]	Fugitive emission limit values [% of solvent input*]
5-15	100	25
> 15	50 for the drying processes 75 for coating application processes	20

* Solvent input: quantity of organic solvents used as input into the process in the time frame over which the mass balance is being calculated (purchased solvent) + quantity of organic solvents recovered and reused as solvent input into the process (recycled solvents are counted every time they are put back into the process cycle).

The respect of the reduction scheme defined in Annexe IIB of the SED leads to the following emission factors:

- For installations with a solvent consumption between 5 and 15 tonnes, the target emission is equal to 0.4 multiplied by the annual reference emission (emission factor = 0.35g solid/g of coating x 1.5 g solvent/g solid x (0.25+0.15) = 0.210g VOC/g of coating).
- For installations with a solvent consumption above 15 tonnes, the target emission is equal to 0.25 multiplied by the annual reference emission (emission factor = 0.35g solid/g of coating x 1.5 g solvent/g solid x (0.2+0.05) = 0.131g VOC/g of coating).

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 reference installations

One reference installation (RI) is defined for the general industry and continuous processes and two for the plastic coating. The representative unit used is the amount of paint consumed annually (t/year).

Table 3.1.1: Reference installation for the general industry

Reference Installation Code RIC	Description	Technical characteristics
01	Medium Installation: 22 tonnes of paints/year	Full load hours: 1,780 h/y [NMVOC]: 0.2 g/m^3 Flow rate: 36,800 m^3/h Solvent input (I*): 16.4 t/y

* As mentioned in the Solvent Management Plan implemented by the SED [2], inputs of organic solvents (I) equal the quantity of organic solvents or their quantity in preparations purchased (I1) + the quantity of organic solvents recovered and reused as solvent input into the process (I2). In this sector, I = I1 because no solvent is recovered. All solvents consumed are assumed to be emitted when no add-on technique is used.

Table 3.1.2: Reference installation for continuous processes

Reference Installation Code RIC	Description	Technical characteristics
01	Medium Installation: 45 tonnes of paints/year	Full load hours: 1,780 h/y [NMVOC]: 0.2 g/m^3 Flow rate: 70,000 m^3/h Solvent input (I*): 31.1 t/y

* As mentioned in the Solvent Management Plan implemented by the SED [2], inputs of organic solvents (I) equal the quantity of organic solvents or their quantity in preparations purchased (I1) + the quantity of organic solvents recovered and reused as solvent input into the process (I2). In this sector, I = I1 because no solvent is recovered. All solvents consumed are assumed to be emitted when no add-on technique is used.

Table 3.1.3: Reference installations for the plastic coating

Reference Installation Code RIC	Description	Technical characteristics
01	Small Installation: 32 tonnes of paints/year	Full load hours: 1,780 h/y [NMVOC]: 0.2 g/m^3 Flow rate: 54,000 m^3/h Solvent input (I*): 24 t/y
02	Large Installation: 320 tonnes of paints/year	Full load hours: 3,000 h/y [NMVOC]: 2 g/m^3 Flow rate: 32,000 m^3/h Solvent input (I*): 240 t/y

* As mentioned in the Solvent Management Plan implemented by the SED [2], inputs of organic solvents (I) equal the quantity of organic solvents or their quantity in preparations purchased (I1) + the quantity of organic solvents recovered and reused as solvent input into the process (I2). In this sector, I = I1 because no solvent is recovered. All solvents consumed are assumed to be emitted when no add-on technique is used.

3.2 Definition of emission abatement techniques

3.2.1 Primary measures

Primary measures are defined according to the type of paint consumed and to the application efficiency. Data come from average figures used for the UK market and assumed to be representative for all countries [1].

Table 3.2.1.1: Primary measures for the general industry

Primary Measure Code PMC	Description
00	"Traditional" solvent-based paints (65% solvent content). Application efficiency of 40%
01	Current solvent-based paints (55% solvent content). Application efficiency of 50%
02	Improved solvent-based paints (45% solvent content). Application efficiency of 65%
03	Water-based paints (5% solvent content – 35% dry matter) – Application efficiency of 65%
04	Powder coatings (100% of solid content) - Application efficiency: 90%

For example, PMC00 represents the 1990 situation in UK; PMC01, the situation in 1998 and PMC02, the situation in 2010. Paint solvent content decreases and application techniques become more efficient so less paints are used for the same job.

Table 3.2.1.2 Primary measures for continuous processes

Primary Measure Code PMC	Description
00	"Traditional" solvent-based paints (60% solvent content). Application efficiency of 70%
01	Improved solvent-based paints (50% solvent content). Application efficiency of 70%
02	Water-based paints (4% solvent content – 35% dry matter). Application efficiency: 98%
03	Powder coatings (100% of solid content). Application efficiency: 96%

Table 3.2.1.3 Primary measures for the plastic coating

Primary Measure Code PMC	Description
00	"Traditional" solvent-based paints (65% solvent content). Application efficiency of 35%
01	"Traditional" solvent-based paints (65% solvent content). Application efficiency of 65%
02	Current solvent-based paints (60% solvent content). Application efficiency of 65%
03	Improved solvent-based paints (55% solvent content). Application efficiency of 65%
04	Water-based paints (5% solvent content – 35% dry matter) – Application efficiency: 65%
05	Powder coatings (100% of solid content). Application efficiency: 96%

For this sector, more primary measures are necessary because the automotive sector is very different from the other plastic parts coated. The use of powder for plastic parts was added after comments from Belgium were received.

3.2.2 Secondary measures

The only secondary measure defined in this document is the thermal oxidation to reduce VOC emissions. Other measures are not assumed to be suitable for this sector.

Table 3.2.2.1: Secondary measures

Secondary Measure Code SMC	Description
00	No secondary measure
01	Thermal oxidiser

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

For the three sub-sectors, some additional country and sector specific parameters are necessary to calculate variable operating costs. They correspond to the costs of the different types of paints and cleaning solvents. Default costs proposed by EGTEI are presented in table 4.2 to 4.4.

Table 4.2: Country and sector specific economic parameters for the general industry (net of taxes)

Parameters	Default costs provided by EGTEI [€/kg]	Country and sector specific costs [€/kg]
Traditional solvent-based paint	6.0	To be provided by national experts
Current solvent-based paint	7.8	To be provided by national experts
Improved solvent-based paint	9.5	To be provided by national experts
Water-based paint	7.8	To be provided by national experts
Powder paint	6.3	To be provided by national experts
Cleaning solvent	0.15	To be provided by national experts

Table 4.3: Country and sector specific economic parameters for continuous processes (net of taxes)

Parameters	Default costs provided by EGTEI [€/kg]	Country and sector specific costs [€/kg]
Traditional solvent-based paint	4.2	To be provided by national experts
Improved solvent-based paint	5.2	To be provided by national experts
Water-based paint	4.8	To be provided by national experts
Powder paint	4.3	To be provided by national experts
Cleaning solvent	0.15	To be provided by national experts

Table 4.4: Country and sector specific economic parameters for the plastic coating (net of taxes)

Parameters	Default costs provided by EGTEI [€/kg]	Country and sector specific costs [€/kg]
Traditional solvent-based paint	4.8	To be provided by national experts
Current solvent-based paint	5.5	To be provided by national experts
Improved solvent-based paint	6.2	To be provided by national experts
Water-based paint	8.0	To be provided by national experts
Powder paint	7.6	To be provided by national experts
Cleaning solvent	0.15	To be provided by national experts

The best source of information for the determination of country and sector specific economic parameters is the national coating association and it is recommended to national experts to contact it.

Default data have been used to calculate variable and annual unit costs presented in paragraph 5.

Information concerning activity levels from 2000 to 2020 for the three sub-sectors 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]. If no information is available at a country level, a lot of data, corresponding to the situation in UK, are provided in the EGTEI document [4].

National experts can also modify default unabated emission factors proposed by EGTEI to represent the reference situation, in a range of ± 10%. These emission factors vary from sector to sector as solvent content in the paints are different. If the modification is higher than 10%, then appropriate explanations are required.

Table 4.5: Unabated emission factor [g of NMVOC / kg of paint] for the general industry

Default emission factor	Country specific emission factor
745.5	To be provided by national expert

Table 4.6: Unabated emission factor [g of NMVOC / kg of paint] for continuous processes

Default emission factor	Country specific emission factor
690.0	To be provided by national expert

Table 4.7: Unabated emission factor [g of NMVOC / kg of paint] for the plastic coating

Default emission factor	Country specific emission factor
750.0	To be provided by national expert

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

Tables 5.1 to 5.3 give an overview of all data provided by EGTEI: 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 unit costs per unit of activity.

Variable costs account for paint and electricity consumptions for the primary measures and electricity, natural gas and labour if a thermal oxidiser is used. Fixed operating costs are only considered for secondary measures and correspond to 5% of the thermal oxidiser investment (for maintenance and insurance). As no economic data are 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 the tables below).

Investments and variable operating costs of secondary measures are calculated from the equations defined in the document “derivation of secondary measure costs: thermal oxidation” downloadable on EGTEI website [7]. Energy can be recovered from exhaust gases in some cases but this assumption is not considered in the variable cost calculation. Technical characteristics of the installations are given in paragraph 3.

Investments of primary measures correspond to new technologies which have to be installed to improve the application efficiency or to use substitution coatings.

Unit costs [k€/ 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).

R&D costs are also incurred to develop new coating types: they account for 11.5 k€ in the general industry. This represents 0.09 k€/t of VOC abated or 0.06 k€/t of paint used. They have to be added on top of the unit costs defined in table 5.1 and are only incurred for a period of ten years.

Table 5.1: Emission factors (EF), efficiencies and costs for each combination (general industry)

RIC PMC SMC	NMVOC EF [g NMVOC / kg paint]	Abatement efficiency [%]	Investment [k€]	Variable Operating Costs [k€ / year]	Fixed Operating Costs [k€/y]	Unit cost [k€/t NMVOC abated]	Unit cost [k€/t paint]
01 00 00	747.5	0.0	0	142.6	0	-	0.00
01 00 01	179.4	76.0	1,060	181.1	53	17.8	10.10
01 01 00	370	50.5	8,2	117.2	0	-3.0	-1.13
01 01 01	88.8	88.1	729.8	137.8	36	8.3	5.49
01 02 00	190	74.6	8,2	92	0	-4.1	-2.27
01 02 01	45.6	93.9	508.2	104	25	3.2	2.21
01 03 00	30.8	95.9	16.5	117.6	0	-1.5	-1.08
01 04 00	0	100.0	18	45.2	0	-5.8	-4.37

Unit costs are only positive when a secondary measure is used to reduce VOC emissions. Thermal oxidation is expensive for small installations and it will be used if no other viable solution is available. The use of substitution products leads to negative unit costs (because of product savings). Several parameters have to be recalled here: in the methodology, investments are amortised on the entire technical lifetime with an interest rate of 4%.

Another issue is that when the paint solvent content is reduced, fewer products are used for the same job leading to savings. Moreover, costs are all compared to the unabated case (PMC00/SMC00) which is the less favorable case in terms of VOC emissions.

R&D costs are also incurred to develop a new type of paint: they account for 81.5 k€ in the sector “continuous processes”. This represents about 0.33 k€/t of VOC abated or 0.22 k€/t of paint used. They have to be added on top of the unit costs defined in table 5.2 for a period of 10 years.

Table 5.2: Emission factors (EF), efficiencies and costs for each combination (continuous processes)

RIC PMC SMC	NMVOC EF [g NMVOC / kg paint]	Abatement efficiency [%]	Investment [k€]	Variable Operating Costs [k€ / year]	Fixed Operating Costs [k€/y]	Unit cost [k€/t NMVOC abated]	Unit cost [k€/t paint]
01 00 00	690.0	0.0	0	210.6	0	-	0.00
01 00 01	165.6	76.0	1,510.6	281.3	75.5	14.1	7.39
01 01 00	432.0	37.4	0	208.4	0	-0.2	-0.05
01 01 01	104.0	84.9	1,227.2	257.8	61.4	9.9	5.78
01 02 00	32.6	95.3	260	201.5	0	0.3	0.22
01 03 00	0.0	100.0	260	101	0	-2.9	-2.01

The same conclusions as above can be drawn here. The use of substitution products is more expensive for this sector because the differences in application efficiencies and in dry matter contents between solvent-based coatings and substitutes are smaller than for the general industry.

R&D costs are also incurred to develop a new type of paint: they account for 90 k€ for small installations and 630 k€ for large installations in the plastic coating. This represents about 0.33 k€/t of VOC abated or 0.22 k€/t of paint used. They have to be added on top of the unit costs defined in table 5.3 for a period of 10 years.

Table 5.3: Emission factors (EF), efficiencies and costs for each combination (plastic coating)

RIC PMC SMC	NMVOC EF [g NMVOC / kg paint]	Abatement efficiency [%]	Investment [k€]	Variable Operating Costs [k€ / year]	Fixed Operating Costs [k€/y]	Unit cost [k€/t NMVOC abated]	Unit cost [k€/t paint]
01 00 00	750	0.0	0	169	0	-	0.00
01 00 01	180	76.0	1 310	224.2	65.5	15.5	8.82
01 01 00	403.1	46.3	12	97.8	0	-6.3	-2.20
01 01 01	96.7	87.1	942	128.8	46.5	5.8	3.81
01 02 00	303.7	59.5	12	97.6	0	-4.9	-2.20
01 02 01	72.9	90.3	806.6	121.6	39.7	4.2	2.85
01 03 00	248.7	66.8	12	98.2	0	-4.4	-2.18
01 03 01	59.7	92.0	724.8	118.4	35.6	3.3	2.31
01 04 00	26.9	96.4	25	155.7	0	-0.5	-0.36
01 05 00	0	100.0	26	60.4	0	-4.4	-3.33
02 00 00	750	0.0	0	1 691.60	0	-	0.00
02 00 01	180	76.0	1 472	1 721.80	73.6	1.6	0.89
02 01 00	403.1	46.3	120	979.1	0	-6.3	-2.20
02 01 01	96.7	87.1	1 046	997.20	52.3	-2.5	-1.62
02 02 00	303.7	59.5	120	977	0	-4.9	-2.21
02 03 00	72.9	90.3	896.55	991.7	44.8	-2.5	-1.71
02 03 01	248.7	66.8	120	982.6	0	-4.4	-2.19
02 04 00	59.7	92.0	801.3	995.3	40.1	-2.5	-1.75

The bigger the installation, the cheaper the measures is. The small installation corresponds to the coating of miscellaneous plastic parts. The large installation is related to the automotive industry. The use of a thermal oxidiser might be a viable option in large installations when the line cannot be stopped to be modified or changed.

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

In the previous RAINS version [5], this sector was studied as a separate sector “other industrial use of paints”. Emission factors were not specific to the sub-sector considered. As defined in the EGTEI document (based on the BCF data), characteristics of each sub-sectors are very different. EGTEI document has divided this very general activity in three sub-sectors presenting homogeneous technical characteristics. The EGTEI specific approach enables taking into account the evolution of the paints and all the specific characteristics of each sector.

EGTEI provides now an approach to consider this sector and test the impact of the current legislation as well as the maximum achievable reduction. The approach has been developed in close cooperation with industry.

Data provided by EGTEI (emission factors and costs) have been implemented in the new RAINS version [2] for the modelling work carried out in the scope of the CAFÉ programme and the revision of the Gothenburg protocol.

For this activity, data provided by national experts through ECODAT can then be directly used by CIAM for introduction in the RAINS model.

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. Research on the potential of use of the different paints and a review of costs should be done on a regular basis to update the document with the latest available information.

8. Bibliography

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[6] Methodology http://citepa.org/forums/egtei/egtei_index.htm
[7] http://citepa.org/forums/egtei/thermal_oxidation_costs_170603.pdf
[8] 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 general industrial application of paints with the help of CITEPA [8].

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

Country and sector 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

As no better product costs are available, default costs for country and sector specific parameters are taken into account for describing the French situation (see chapter 4).

Activity level

Activity forecasts from 2000 to 2020 come from data provided by the French national expert. They are based on the added value historical trend of the branch “metallurgy” for the first two sectors (+1.01%/y) and of the branch “chemistry, rubber and plastics” for the plastic coating (+4.29%/y).

Paint consumption in the industry is considered all together in the French statistics. The following decomposition is based on EGTEI default data coming from the BCF statistics [1].

Table A.2: Activity levels per sub-sector (kt of paint / year)

RIC	2000	2005	2010	2015	2020
General industry: 01	113.3	119.2	125.3	131.8	138.6
Continuous processes: 01	67.0	70.5	74.1	77.9	81.9
Plastic coating: 01	15.8	19.5	24.1	29.7	36.6
Plastic coating: 02	23.7	29.3	36.1	44.6	55.0
Total (kt)	219.9	238.4	259.6	284.0	312.1

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 dates of compliance.

In 2000, water-based and powder coatings were already used to a certain extent in France. The amount of each type of paints is derived from the annual French statistics. The solvent-based paint solvent contents are regularly reviewed with experts from the French paint manufacturer association [FIPEC]. Secondary measures are assumed not to be used in this sector. Some thermal oxidisers might already be installed in the manufacture of metal packaging but it is taken into account in the EGTEI document “Flexography and rotogravure in the packaging”. Application rates of the different abatement techniques are determined so that total VOC emissions for this sector correspond to VOC emissions defined in the French inventory provided by CITEPA [8].

Data developed by the BCF [1] at a sub-sector level were used to define the French situation from 2005 to 2020. It is also assumed that 35% of solvents are consumed in installations using less than 5 tonnes of solvents per year (which is under the SED threshold). No control is assumed on these solvent-based paints (only the progressive reduction of solvent contents).

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 [%]	Application rate in 2010 [%]	Application rate in 2015 [%]	Application rate in 2020 [%]
01 00 00	0	0	0	0	0
01 00 01	0	0	0	0	0
01 01 00	36.4	0	0	0	0
01 01 01	0	0	0	0	0
01 02 00	0	15	15	15	15
01 02 01	0	15	15	15	15
01 03 00	38.5	40	40	40	40
01 04 00	25.1	30	30	30	30
Total general Indus.	**100**	**100**	**100**	**100**	**100**
01 00 00	72.4	0	0	0	0
01 00 01	0	0	0	0	0
01 01 00	0	20	10	10	10
01 01 01	0	45	45	45	45
01 02 00	15	15	15	15	15
01 03 00	12.6	20	30	30	30
Total continuous proc.	**100**	**100**	**100**	**100**	**100**
01 00 00	60	0	0	0	0
01 00 01	0	0	0	0	0
01 01 00	0	0	0	0	0
01 01 01	0	0	0	0	0
01 02 00	0	45	0	0	0
01 02 01	0	0	0	0	0
01 03 00	0	0	34	34	34
01 03 01	0	10	10	10	10
01 04 00	40	45	56	56	56
01 05 00	0	0	0	0	0
Plastic coat. RIC01	**100**	**100**	**100**	**100**	**100**
02 00 00	70	10	0	0	0
02 00 01	0	0	0	0	0
02 01 00	0	0	0	0	0
02 01 01	0	0	0	0	0
02 02 00	0	0	0	0	0
02 02 01	0	40	40	40	40
02 03 00	0	0	0	0	0
02 03 01	0	0	0	0	0
02 04 00	30	50	60	60	60
Plastic coat. RIC02	**100**	**100**	**100**	**100**	**100**

Appl.: applicability factor

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. The three sub-sectors are considered together.

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	70,348	21,851	17,162	18,808	20,717
Annual total costs	**k€/year**	**k€/year**	**k€/year**	**k€/year**	**k€/year**
CLE scenario	-237,134	-94,936	-118,216	-133,178	-150,983

Emissions presented in table B.1 for the year 2000 according to the CLE scenario have been calculated with EGTEI emission factors. Emissions defined in the French inventory for the year 2000 are about 70,000 tonnes of VOC. This shows that EGTEI data can be used to define all situations.