Final Background Document
on the sector

Truck cabin coating

Prepared in the framework of EGTEI

Prepared by CITEPA, Paris

Summary

Sector : Truck cabin coating

SNAP: 06 01 01 02 or NFR 3A Paint application

ACTIVITY : number of trucks cabins produced / year
POLLUTANT CONSIDERED : VOC

This document has been simplified compared to the sector "Car coating" which is very detailed. Hereafter, one reference installation is defined.
Data currently used in the RAINS model are detailed in the background document : "Car coating".

The European Automobile Manufacturers Association (ACEA) [1] has strongly participated in the elaboration of this background document. Data come from a survey on several installations.

1 EU regulation : Directive 1999/13/EC of 11 March 1999 [2]

Operators concerned can conform to the Directive by complying with the total emission limit values. Directive applies to installations with a solvent consumption above 15 t per year.

Emission limits for application of the Directive are presented in table 1.1.

Table 1.1 : Emission limits

All obligations of the Directive are not described in this chapter.

Activity (type of vehicle)	Production threshold [number of vehicles]	Total emission [g VOC / m²]	
	Annual production	New installations	Existing installations
Truck cabin coating	> 5000	55 g / m^2	75 g / m^2
	≤ 5000	65 g / m^2	85 g / m^2

2 Definition of the Reference Installation [1]

The Reference installation is defined according to its production of trucks cabins per year.

The reference installation is presented in table 2.1.

Table 2.1 : Reference installation

Reference Installation Code RIC	Description
01	Medium Installation : output > 25 000 units / y

3 Definition of aggregated measures [1]

In this document, no distinction between primary and secondary measure is made. Measures are defined as a mix of techniques enabling to reach the Directive requirements [2] and to go further.

Average surface per vehicle : 60 m²

Measure 00 represents the reference case. Only conventional solvent based products are used.
Measure 01 : this intermediate measure corresponds to the use of water based primer and high solid enamel.
Measure 02 : in order to reach the Directive limit value (75 g/m²), a partial VOC abatement in the enamel spray booths is required.
Measure 03 : this final measure corresponds to the use of waterborne enamel. As this is in most cases hard to modify an existing installation in order to adopt water based enamel (basically for lack of space), the unique alternative is to build an new installation in a new building.

Table 3.1 : Definition of aggregated measures

Measure code MC	Description of the measure
00	**Reference case:** 50 % two layer – 50 % one layer • Solvent based primer • Solvent based basecoat • Solvent based clear coat • Solvent based solid coat Incineration on electrophoresis oven applied
01	50 % two layer – 50 % one layer • Electrophoresis • Waterborne primer • High solid basecoat • High solid clear coat • High solid solid coat • Improvement of the cleaning stages Improved solvent recovery / solvent consumption reduction Incineration on electrophoresis oven, primer and enamel
02	01 + partial VOC abatement in the enamel spray booths
03	80 % two layer – 20 % one layer • Electrophoresis • Waterborne primer • Waterborne basecoat • High solid clear coat • Waterborne solid coat • Improvement of the cleaning stages Improved solvent recovery / solvent consumption reduction Incineration on electrophoresis oven, primer and enamel

4 Emission abatement techniques and costs [1]

Emission factors, investments and operating costs have been defined with [1]. No country specific parameters are defined for this sector. These costs are assumed to be representative of the European situation.

4.1 Definition of the emission factors

Table 4.1.1 : Emission factors (EF) for MC 00

Layer	Emission factor (g VOC/m²)	Emission factor (kg VOC/vehicle)
Electrophoresis	5	
Primer (conventional)	10	
Basecoat (conventional)	92	
Clearcoat (conventional)		
Solid coat (conventional)		
Cleaning	30	
TOTAL	137	137 × 60 / 1 000 = 8,2

Table 4.1.2 : Emission factors (EF) for MC 01

Layer	Emission factor (g VOC/m²)	Emission factor (kg VOC/vehicle)
Electrophoresis	5	
Primer (waterborne)	5	
Basecoat (high solid)	52	
Clearcoat (high solid)		
Solid coat (high solid)		
Cleaning (improved)	20	
TOTAL	82	4,9

Table 4.1.3 : Emission factors (EF) for MC 02

Layer	Emission factor (g VOC/m²)	Emission factor (kg VOC/vehicle)
01 + partial VOC abatement in the enamel spray booths	75	4,5

If MC 02 can not be implemented for some reasons, the only alternative is to build a new workshop (MC 03). MC 03 presented in table 4.1.4 gives information on the best practices available.

Table 4.1.4 : Emission factors (EF) for MC 03

Layer	Emission factor (g VOC/m²)	Emission factor (kg VOC/vehicle)
Electrophoresis	5	
Primer (waterborne)	5	
Basecoat (waterborne)	35	
Clearcoat (high solid)		
Solid coat (waterborne)		
Cleaning (improved)	10	
TOTAL	55	3,3

4.2 Determination of costs

4.2.1 Investments

Investments have been defined with [1]. They take into account :

- End of pipe devices,
- Building, relative facilities and all equipments for a new installation, including spray booths for water based products in case of final measure.

Table 4.2.1.1 : Investments incurred for the different measures

Measure Code MC	Investment (M€)
00	0
01	6
02	12
03	40

4.2.2 Operating costs

❖ Variable operating costs

Variable operating costs are defined per layer. The following parameters are considered :

- Product costs,
- Energy costs : natural gas, electric power (electrophoresis, thermal oxidation, spray booths),
- Manpower.

Neither savings nor additional costs are considered for the cleaning improvement. On one hand, cleaning solvent consumption is reduced which leads to savings but on the other hand, some solvents are recycled externally.

Table 4.2.2.1 : Variable operating costs per layer for the measure 01

Layer	Additional variable operating costs (€ / year)
Electrophoresis	-
Primer (waterborne)	+ 121 000
Basecoat (high solid)	+ 169 000
Clearcoat (high solid)	
Solid coat (high solid)	
Cleaning (improved)	
TOTAL	+ 290 000

Table 4.2.2.2 : Variable operating costs per layer for the measure 02

Layer	Additional variable operating costs (€/year) *
01 + partial VOC abatement in the enamel spray booths	+ 290 000

* No information is available on operating costs incurred for the thermal oxidation in the enamel spray booths. These costs are believed to be very high.

Table 4.2.2.3 : Variable operating costs per layer for the measure 02

Layer	Additional variable operating costs (€/year) *

Electrophoresis	-
Primer (waterborne)	+ 121 000
Basecoat (waterborne)	+ 510 000
Clearcoat (high solid)	
Solid coat (waterborne)	
Cleaning (improved)	
TOTAL	+ 631 000

* Referred to the reference case MC 00

- ❖ Fixed operating costs

Fixed operating costs are considered to be 5% of the investments of end of pipe devices.

Table 4.2.2.4 : Investments for end of pipe devices with corresponding operating costs

Measure Code MC	Investment (M€)	Fixed OC (M€)
00	0	0
01	1,8	1,8 × 0,05 = 0,09
02	7,8	0,39
03	4,8	0,24

4.3 Emission factors and costs data for the different combinations

Table 4.3.1 : Emission factors (EF) and abatement efficiencies for each relevant combination

RIC MC	VOC EF [g/m^2 vehicle coated]	VOC EF [kg / vehicle coated]	Abatement Efficiency [%]	Q	CI %
01 00	137	8,2	0,0	4	20
01 01	82	4,9	40,1	4	20
01 02	75	4,5	45,3	4	20
01 03	55	3,3	59,9	4	20

Table 5.3.2 : Investments and operating costs

RIC MC	Investment [k€]	Q	CI %	Variable OC [k€ /y]	Q	CI %	Fixed OC [k€ / y]	Q	CI %
01 00	0	4	-	0	4	-	0	4	-
01 01	6 000	4	25	290	4	25	90	4	25
01 02	12 000	4	25	290 *	4	25	390	4	25
01 03	40 000	4	25	631	4	25	240	4	25

* No information is available on operating costs incurred for the thermal oxidation in the enamel spray booths. These costs are believed to be very high.

5 Data to be provided by national experts for the completion of the database for their own country

The following tasks are required :

5.1 Validation work

For representing costs in this sector, the national expert is invited to comment the methodology defined by the Secretariat.

- Validate the default investments and operating costs provided,

Or

- Provide other costs for the same combination of techniques and justify them.

Comments have to be sent to the Secretariat in the two weeks after the electronic publication of the document.

5.2 Provision of specific data

Tables to be filled in by national experts

- Determination of country specific data to calculate variable costs (they are valid for all VOC sectors and only have to be entered in the tool once).

No country specific costs are considered for this sector.

- Total activity level in accordance with units used in the document (number of trucks cabins).

In order to provide IIASA with aggregated data, the following data must be collected:

Table 5.2.1 : Activity levels in absolute value (number of trucks cabins / y)

RIC	2000	CI%	2005	CI%	2010	CI%	2015	CI%	2020	CI%
01										
Default values proposed for CI		10		20		50		100		100

For explanations on the coefficient of variation (CI), please refer to the Methodology.

- Total activity (number of truck cabins / y) has to be estimated from 2000 to 2020.
- Total activity should evolve.

- Respective percentage of combinations of reduction measures in 2000 as well as if possible, the percentage of use in 2005, 2010, 2015, 2020 due to the VOC Directive or national regulations and applicability according to the definition used in the RAINS model.

Table 5.2.2 : Application rate and Applicability for each combination of reduction measures

RIC MC	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									
01 01									
01 02									
01 03									
Total RIC 01	**100**	**100**		**100**		**100**		**100**	

Table 5.2.3 : Unabated emission factor [g / m² of trucks cabins coated]

Default data mean	CI %	User input mean	CI %
137	20		

The "default data mean" can be modified in a range of ± 10%.
If a measure is missing in the document, national experts have to contact the secretariat to add it in the background document.

6 References

[1] ACEA representative. European Automobile Manufacturers Association.
211 rue du noyer. B-1000 Brussels – Belgium

[2] 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.

7 Modifications compared to the draft document

Modification of chapter 4

Investments of secondary measures have been estimated [1] and fixed operating costs have been added to be consistent with the other sectors.