

7.29 Coating processes 4: coating of metal, wood, plastic and other surfaces (fabric, leather, paper...)

7.29.1 Coverage

Only industrial uses of paints are considered in this section. The use of domestic and architectural paints is studied in another paragraph. Coating of cars and other vehicles, coil coating and coating of winding wire are defined in other sections as abatement techniques applied are very specific.

7.29.2 Emission sources

Within this source category, VOC emissions are released from the application of paint, from drying ovens and from the cleaning of equipment and paint cabins. According to reference [1], due to the high variety of techniques used and the highly different requirements for the quality of coatings, uniform reduction techniques can not be defined.

The requirements of the surface coating show significant differences within the sectors of paint application. The solvent content of products is very variable:

a/ Solvent based paints

Conventional solvent based paints contain approximately 30 to 80 wt. % of organic solvents.

High solid paints have a solid content above 65%.

b/ Water based paints

Water based paints contain from less than 1% to 18% of organic solvents used as solubilizer and for the improvement of properties of the wet film layer.

These paints are available and are widely used. Their range of application is increasing continuously.

c/ Powder coatings

Powder coatings are solvent free materials. Most often, overspray is recycled so the transfer efficiency is pretty high. For drying, the material is heated and thus merged into a film. Powder coatings are mainly applied via electrostatic assisted spraying on the work pieces. In several sectors, this technique is well established.

7.29.3 BAT, Associated Emissions Levels (AEL)

BAT AEL are based on the STS BREF [2] for large installations consuming more than 200 tones of solvent a year and on the SED Directive [3] for smaller installations (associated emission factors are based on solvent reduction scheme calculations).

a/ General issues

The typical exhaust air from the coating industry has a high flow rate and a low organic solvent content, which means that energy costs for end-of-pipe measures can be significant. Therefore, if this option is chosen, processes should be used that have low energy consumption and/or high energy recovery rates. A further solution is to use a preceding concentration step via adsorption/desorption processes. The use of low and no organic solvent paints and cleaning methods is in many cases the most effective means of reducing organic solvent emissions in industrial painting.

Furthermore, for industrial applications, emission reduction technologies exist, such as improvement of the application processes: e.g. electrostatic guns and other spray techniques instead of conventional pneumatic application, low solvent-based coating systems, and sometimes automatization of application. Also, paint recovery (e.g. overspray recovery) is a proven VOC abatement option in the wood- and metal-coating sectors.

b/ Specific issues for the wood coating

In the coating of wood materials, water-based coatings are not suitable with oak; powder coatings are only suitable for MDF (Medium-density fiberboard) and radiation cured coatings are suitable for flat pieces only.

Table 1: Emission sources and selected VOC control measures with associated emission levels for coating processes

Type of installation	Combination of control measures	BAT associated emission levels for VOC [Defined for the following averaging period: yearly for total AEL]
Large installations [2]		
Coating of furniture and wood materials	Waste gas treatment such as thermal oxidation when other techniques are not available or do not achieve suitable levels	0.25 kg or less of VOC / kg of solid input
	Use of low or non-solvent paints and, maximize efficiency of paint application	
	High organic solvent paints (solvent content of w-% 65) with high application efficiency technique (rolling, flooding, electrostatically assisted spraying, airless spraying) and good housekeeping	40 – 60 g VOC/m²
	Medium organic solvent paints (solvent content of w-% 20) with high application efficiency technique and good housekeeping	10 – 20 g VOC/m²
	Low organic solvent paints (solvent content of w-% 5) with high application efficiency technique and good housekeeping	2 – 5 g VOC/m²
Coating of plastic workpieces	Waste gas treatment	0.25 to 0.35 kg or less of VOC / kg of solid input
	Use of low solvent paints or water-based paints and, maximize efficiency of paint application	
Coating of metal surfaces	Waste gas treatment	0.10 to 0.33 kg or less of VOC / kg of solid input
	Use of low solvent paints or water-based paints and, maximize efficiency of paint application	
Small installations [3]		
Coating of furniture and wood materials	Waste gas treatment such as thermal oxidation when other techniques are not available or do not achieve suitable levels	1 to 1.6 (for installation consuming less than 25 tonnes of solvents per year) or less of VOC / kg of solid input
	Use of low or non-solvent paints and, maximize efficiency of paint application	
	Use of low solvent paints or water-based paints and,	

	maximize efficiency of paint application	
Coating of metal and plastic surfaces	Waste gas treatment	0.375 – 0.6 (for installation consuming less than 15 tonnes of solvents per year) or less of VOC / kg of solid input
	Use of low solvent paints or water-based paints and, maximize efficiency of paint application	

According to CEPE [7], for metal and plastic coating 0.375 kg VOC emission per kg NV consumption is achievable by a combination of very high solids primer and high solids topcoat wet-on-wet which is a suitable process for many applications. Lower limits may apply for metal surfaces in cases where electrocoat, powder or other high-bake materials can be used. It might be unachievable for many low bake operations and would trigger need for abatement of spray-booth exhaust air as undesired add-on measure.

7.29.4 Costs

Costs are defined in the EGTEI documents concerning “paint in the general industry” [4] and “wood coating” [5].

For the coating in the industry (general industry, continuous processes, plastic coating), abatement costs vary between 2 and 18 k€/tonne of VOC abated depending on the size of the installation and are negative for primary measures (higher application process efficiencies lead to the reduction of solvent consumptions so less products are used).

For the coating of wood, abatement costs vary from 2 to 16 k€/tonne of VOC abated depending on the size of the installation and are negative if emissions are reduced by primary measures.

Caution: these documents are susceptible to evolve if new updated data are available.

7.29.5 Emerging techniques

The electrostatically assisted application of powder coatings onto non-conductive wood and wood materials is under development [2].

7.29.6 References used in chapter 7.29

- [1] BAT for paint and adhesive applications in Germany, IFARE – 2002
- [2] STS BREF – August 2007
- [3] 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
- [4] EGTEI background document/synopsis sheet: Paint in the general industry – 2003/2005
- [5] EGTEI background document/synopsis sheet: Wood coating – 2003/2005
- [6] Compilation of the answers-to-questions-and proposal of EGTEI secretariat.doc – EGTEI - 02/2009
- [7] Comments from CEPE – March 2009

