2.D.3.g - Chemical Products

Short description

Category Code	Method					AD					EF				
2.D.3.g	T2					NS					CS				
	NO_x	NMVOC	SO_2	NH_3	$PM_{2.5}$	PM_{10}	TSP	BC	CO	Pb	Cd	Hg	Diox	PAH	HCB
Key Category:	-	L/-	-	-	-	-	-	-	-	-	-/-	-	-	-	-

T = key source by Trend **L** = key source by Level

Methods	
D	Default
T1	Tier 1 / Simple Methodology *
T2	Tier 2*
T3	Tier 3 / Detailed Methodology *
C	CORINAIR
CS	Country Specific
M	Model

* as described in the EMEP/EEA Emission Inventory Guidebook - 2019, in the group specific chapters.

AD - Data Source for Activity Data	
NS	National Statistics
RS	Regional Statistics
IS	International Statistics
PS	Plant Specific data
As	Associations, business organisations
Q	specific Questionnaires (or surveys)
M	Model / Modelled
C	Confidential

EF - Emission Factors	
D	Default (EMEP Guidebook)
C	Confidential
CS	Country Specific
PS	Plant Specific data
M	Model / Modelled

Source category *NFR 2.D.3.g - Chemical products* comprises NMVOC emissions from the use of solvents in the following manufacture processes:

- Polyester processing
- Polyvinylchloride processing
- Polyurethane processing
- Polystyrene foam processing
- Rubber processing
- Pharmaceutical products manufacturing
- Manufacture of paints and lacquers,
- Manufacture of inks
- Glues manufacturing
- Bitumen blowing
- Adhesive manufacturing, magnetic tapes manufacturing, photographs manufacturing
- Solvents manufacturing:
    - Manufacture of wood preservatives
    - Manufacture of building material additives
    - Manufacture of solvent-based consumer goods
    - Manufacture of surface cleaning agents
    - Manufacture of antifreeze agents and de-icers

- Manufacture of waxing and dewaxing agents
- Manufacture of paint strippers

‘NMVOC’ is defined in accordance with the VOC definition found in the EC solvents directive. For purposes of the definition of solvents, the term ‘solvent use’ is also defined in accordance with the EC solvents directive.

Method

General procedure

NMVOC emissions are calculated in accordance with a product-consumption-oriented approach. In this approach, solvent-based products or solvents are allocated to the source category, and then the relevant NMVOC emissions are calculated from those solvent quantities via specific emission factors. Thus, the use of this method is possible with the following valid input figures for each product group:

- Quantities of VOC-containing (pre-) products and agents used in the report year,
- The VOC concentrations in these products (substances and preparations),
- The relevant application and emission conditions (or the resulting specific emission factor).

The quantity of the solvent-based (pre-)product corresponds to the domestic consumption which is the sum of domestic production plus import minus export.

NMVOC Emission = domestic consumption of a certain product * solvent content * specific emission factor

The calculated NMVOC emissions of different product groups for a source category are then aggregated. The product / substance quantities used are determined at the product-group level with the help of production and foreign-trade statistics. Where possible, the so-determined domestic-consumption quantities are then further verified via cross-checking with industry statistics.

Discussion of emission trends

General information

Since 1990, so the data, NMVOC emissions from use of solvents and solvent-containing products in general have decreased by nearly 55%. The main emissions reductions have been achieved in the years since 1999. This successful reduction has occurred especially as a result of regulatory provisions such as the 31st Ordinance on the execution of the Federal Immissions Control Act (Ordinance on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain facilities – 31. BImSchV), the 2nd such ordinance (Ordinance on the limitation of emissions of highly volatile halogenated organic compounds – 2. BImSchV) and the TA Luft.

Specific information

Since 1990, data of source category 2.D.3.g are recorded. Since 2000, a more detailed data collection procedure enables to follow the development of different applications, which altogether accounts for about 7 - 8% of total NMVOC emissions from solvent-based products.

Total emissions of NMVOC emissions of 2.D.3g remain relatively stable. In some major activities amounts of NMVOC emissions raised, such as from solvents used in polystyrene foam processing and the manufacture of solvent-based consumer products.

Bitumen blowing

Method

Bitumen used for road paving, roof coating and other application like pipe sealing needs some enhanced properties that can be achieved by air blowing. This is done in so called bitumen blowing units (BBU) that can operate either in continuous or in batch mode. The BBU usually are located in refineries or can be part of road paving or roof coating plants. Thermal post-combustion in combination with closed capture systems to control emissions are best available technology and demanded by relevant legislation in Germany. In the GB 2019 [Lit. 2] Tier 2 emission factors for bitumen blowing are presented for NMVOC, TSP, Cd, As, Cr, Ni, Se and PAH. As the emission factors for TSP and heavy metals are unreferenced and based on US plants before 1980 they seem to be unsuitable to represent national conditions. That's why own emission factors are used.

Activity data

The applicable quantities of treated bitumen are calculated from the total-bitumen-production figures published annually by the Federal Office of Economics and Export Control (BAFA), in its official mineral-oil data (Amtliche Mineralöldaten) [Lit. 3]. The applicable percentage share of blown bitumen was obtained from a one-time data survey of the association Arbeitsgemeinschaft der Bitumenindustrie e.V (bitumen industry working group) [Lit. 4] that was carried out for the year 1994, in the framework of a project [Lit. 5] commissioned by the Federal Environment Agency (UBA). The percentage share remains constant for all years in question, and it amounts to 10%.

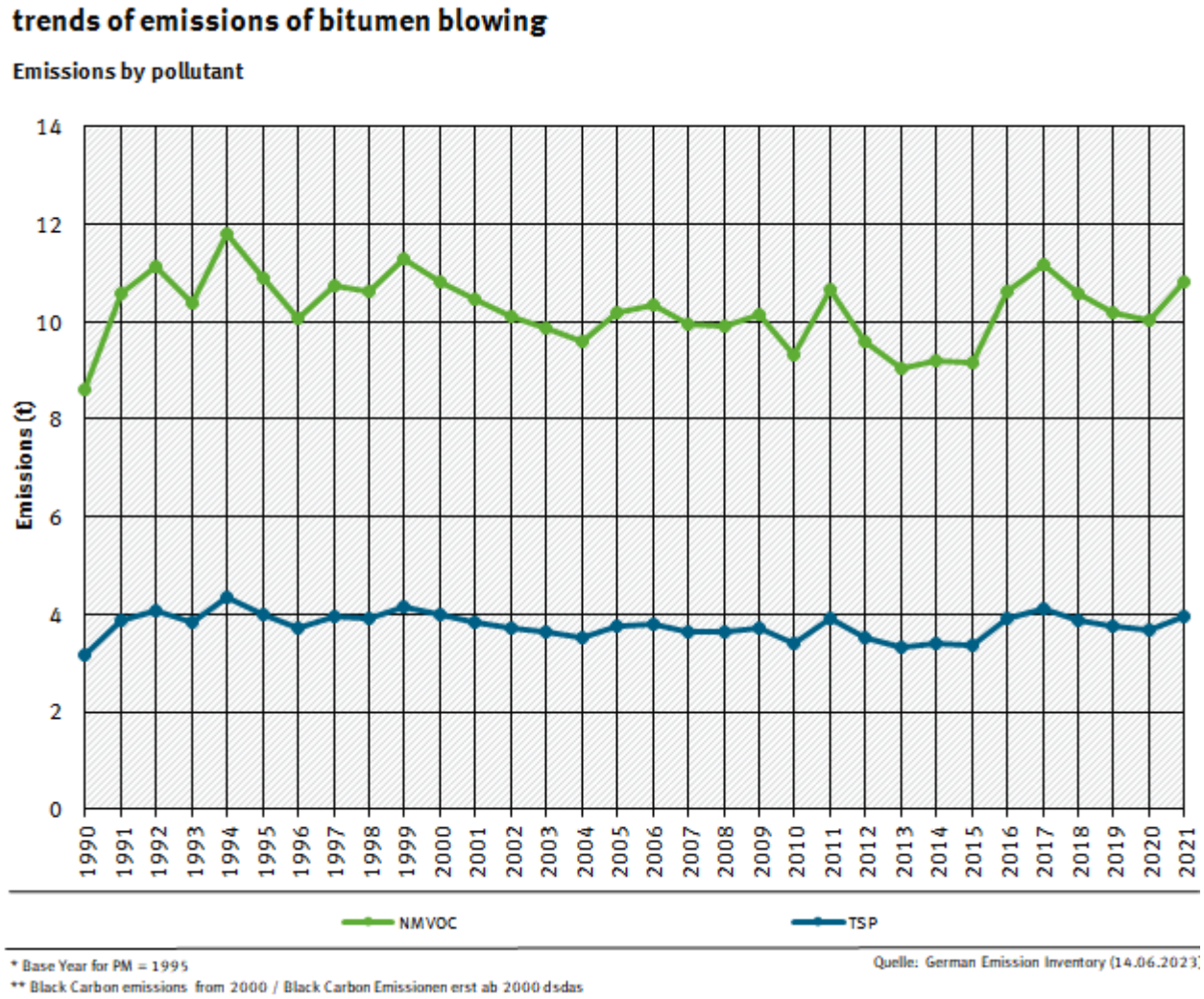
Emission factors

The NMVOC and PAH emissions that result from bitumen blowing are calculated with an emission factor derived from the uncontrolled standard emission factor of the GB 2019 taking account of the maximum permitted levels and reduction-measures requirements specified in the Technical Instructions on Air Quality Control (TA Luft). The emission factors for Cd, Cr and Ni were taken from real measurements with an increased safety factor (maximum or ten-fold). All emission factors remain constant for all years in question.

Table 1: Overview of the tier-2 emission factors applied for bitumen blowing with post-combustion

	EF 2010	Unit	Trend
NMVOC	27.20	g/t	default (Lit. 2)
TSP	10.00	g/t	constant (Lit. 6)
Cd	0.03	mg/t	constant (Lit. 6)
As	0.50	mg/t	default (Lit. 2)
Cr	4.00	mg/t	constant (Lit. 6)
Ni	21.00	mg/t	constant (Lit. 6)
Se	0.50	mg/t	default (Lit. 2)
PAH	2.55	mg/t	default (Lit. 2)

Trends discussion (for key categories)



Uncertainties

Emission factors: Relative error rates at ±15% and ±25% (Adhesive manufacturing, magnetic tapes manufacturing, photographs manufacturing) were applied, but not exceeding 100% or falling below 0%. Uncertainties refer to a 95% confidence interval. For bitumen blowing emission factor uncertainties are on a higher level just to 100%. For Cd and TSP the uncertainty are even greater than a factor of two.

Recalculations

Routinely, the NMVOC emissions of the last reported year must be actualized in the next reporting cycle as the final data of the foreign trade statistics are regularly only available after the publication of the respective reporting year has been completed.

For the year 2020, this adjustment is postponed to the submission 2024 because for some applications the calculation bases also have to be reviewed for further years and this review could not be completed in time for the 2023 reporting.

For **pollutant-specific information on recalculated emission estimates for Base Year and 2020**, please see the pollutant specific recalculation tables following chapter 8.1 - Recalculations.

Planned improvements

For bitumen blowing a visual NMVOC emission trend description will be added.

Bibliography

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Lit. 2: EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook 2019, Copenhagen, 2019 https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/2-industrial-processes/2-d-l-other-solvent/2-d-3-g-chemical/view, table 3-8
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Lit. 6: Trumbore, David C. (Owens Corning, Asphalt Technology Laboratory, Summit, IL 60501; Spring 1998). The Magnitude and Source of Air Emissions from Asphalt blowing operations. *Environmental Progress*, Vol. 17, No. 1