



bluesign® CRITERIA for production sites

ANNEX: VOC management

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1 Background

The use of organic solvents in certain activities gives rise to emissions of organic compounds to the air (volatile organic compounds – VOCs) that can be harmful to public health and/or contribute to local and transboundary formation of photochemical oxidants in the boundary layer of the troposphere, which cause damage to the natural environment and, under certain exposure conditions, have harmful effects on human health.

Appropriate management of VOCs shall be a focus of all production sites that handle solvents. Advanced requirements apply to bluesign® SYSTEM PARTNERS that use a significant volume of organic solvents exceeding a specific threshold limit.

2 Scope

This document applies to production sites using volatile organic compounds (VOCs) across all BLUESIGN manufacturer categories. These processes are (among others):

- Manufacturing of coating pastes, printing pastes, inks, paints and lacquers
- Fiber manufacturing based on wet spinning and dry spinning
- Transfer paper printing (rotogravure printing)
- Solvent based coating and solvent based membrane manufacturing
- Painting and lacquering
- Solvent based degreasing and paint stripping
- Footwear production
- Application of adhesives in assembly operations
- Textile dry cleaning
- Solvent based sizing

Along with the general requirements defined in this document, which are applicable at all sites using solvents, there are advanced requirements that apply to production sites with significant consumption of solvents and corresponding major VOC impact:

- Chemical supplier production site with annual solvent consumption greater than 100 t
- Manufacturer production site with annual solvent consumption greater than 5 t

VOC consumption consists of VOCs used in pure form and VOCs contained in mixtures.

Note: For off-gas emissions from textile finishing processes carried out at stenters, the emission factor concept is valid (see *bluesign® CRITERIA for production sites - Annex: Textile manufacturer*).

3 Definitions

3.1 Volatile organic compound (VOC)

Any organic compound having a vapor pressure of 0.01 kPa or more at 293.15 K, or having a corresponding volatility under specific conditions of use.

3.2 Organic solvent

Any VOC which is used alone or in combination with other agents, and without undergoing a chemical change, to dissolve raw materials, products or waste materials, or is used as a cleaning agent to dissolve contaminants, or as a dissolver, or as a dispersion medium, or as a viscosity adjuster.

3.3 Production site

A stationary technical unit that is under the control of a legally independent entity, including any directly related activities that have a technical connection to the activities carried out at the site that could have an effect on emissions.

3.4 Manufacturer

A company that produces textile articles (at all processing levels), leather and/or accessories

3.5 Chemical supplier

A company that under its own trade name markets chemical products, such as auxiliaries, dyestuffs or other chemical products, for the production of textiles, leather and/or accessories. A chemical supplier may be a manufacturer, a formulator or a rebrander of chemical products. A producer of chemical products that directly uses the produced chemicals for downstream processing of articles is also considered to be a chemical supplier.

3.6 Consumption

For the purpose of this document consumption means the total input (purchased volume) of organic solvents (either pure or in mixtures) to a facility or installation per calendar year or any other 12-month period.

3.7 Production site with major VOC impact

A chemical supplier or manufacturer exceeding the threshold limit for consumption of solvents at the site:

- Chemical supplier production site with annual solvent consumption greater than 100 t
- Manufacturer production site with annual solvent consumption greater than 5 t

For a comprehensive list of terms and abbreviations, see the document *bluesign® glossary*.

4 Best Available Techniques (BAT)

A manufacturer carrying out VOC relevant processes as described in this document shall be aware of best available techniques (BAT) that are relevant for the industry concerned (see <http://eippcb.jrc.ec.europa.eu/reference/>, Code CVV and WGC).

5 General requirements

Every site within the scope must be able to reliably determine that its solvent consumption is below the threshold limit for production sites with major VOC impact (see Chapter 3.7 and 6.1.1).

The following measures (including Chapter 5.1 to 5.5) shall be evaluated for feasibility (with consideration of proportionality and appropriateness), and documentation of the evaluation shall be kept on file:

- Recovery of solvents where possible
- Re-use of solvents where possible
- Containment and enclosure of sources to prevent fugitive emissions
- Adapted maintenance program for all installations
- Compliance with BSBL (chemical supplier)
- Appropriate testing program for compliance with BSSL limits for solvents in articles (manufacturer)

5.1 Input stream management

- The possibility to switch to water based or low VOC systems shall be subject to regular evaluation
- Changing to safe or less harmful solvents shall be evaluated (the goal shall be to phase out carcinogenic, mutagenic and reproduction toxic (CMR) solvents)
- Changing to solvents with lower volatility shall be evaluated
- Changing to solvents with lower global warming potential and ozone depletion potential shall be evaluated

5.2 Occupational health and safety

Many VOCs are harmful to human health when released into the workplace atmosphere or in contact with human skin.

Therefore, special emphasis shall be placed on the following aspects:

- Comprehensive risk assessment
- Minimization of release of VOCs into the workplace atmosphere (e.g. by use of closed machinery, by use of local exhaust ventilation (LEV) systems, or by substitution)
- Monitoring of relevant substances/VOCs in the workplace atmosphere to demonstrate compliance with the occupational exposure limits compiled in the *Guidance Sheet – Occupational Exposure Limits (OEL)* or defined by local authorities
- Prevention of skin contact (e.g. by process automation or use of suitable PPE)
- Precautionary measures to prevent exposure of special risk groups to particularly hazardous solvents (e.g. exposure of women to N,N-DMF (CAS 68-12-2))

5.3 Emissions to water

Solvent emissions to water shall be avoided. Solvents that are not readily dissolved in water and/or not readily biodegradable shall not be discharged to wastewater treatment facilities. External wastewater treatment facilities shall be informed if discharged wastewater contains any solvent.

5.4 Emissions to soil and groundwater

Emissions of VOCs or organic solvents to the soil and groundwater shall always be prevented. In case of contamination (current or historic), effective remediation measures shall be applied.

5.5 Emergency preparedness

5.5.1 Explosion protection

Explosive atmospheres can build up during work with solvents and VOCs (e.g. at workplaces or in containers and vessels). Suitable assessments shall be performed, and suitable precautionary measures applied (e.g. explosion-proof electrical equipment, ventilation).

6 Advanced requirements

Along with the general requirements, the following advanced requirements apply to production sites with major VOC impact:

- Chemical supplier production site with annual solvent consumption greater than 100 t
- Manufacturer production site with annual solvent consumption greater than 5 t

6.1 Air emissions

Sites with major VOC impact (as defined above) shall comply with the following air emission limits for total organic carbon (TOC) in off-gas or for efficiency:

- Less than 50 mg TOC per m³ (for each individual emission port¹)
or
- Less than 0.5 kg TOC per hour (total for the whole facility)
or
- More than 80% efficiency of TOC elimination at each emission port (with a goal of 95%).

¹ Recommended standardized reference method of testing: EN 12619 "FID analyzer", 15% standard uncertainty

Additionally, the following requirements apply:

- The bluesign® SYSTEM PARTNER shall generate a VOC mass balance for the production site and carry out annual updates (for further information see Chapter 6.1.1).
- If toluene (CAS 108-88-3), N,N-dimethylformamide (CAS 68-12-2) or any other CMR substance (Cat. 1A,1B or 2) is used at the site, the efficiency of off-gas cleaning for these substances shall be 80% or higher (measured as substance). The abatement goal shall be a cleaning efficiency of 95%.
- More stringent off-gas abatement requirements as per 'Guidance Sheet – CMR-Solvent Management' do apply for the following industries and processes in case CMR solvents are used: Textile manufacturing (esp. coating and laminating processes), manufacturing of membranes, footwear industry (including assembling, manufacturing of synthetic leather (mostly PU coatings) and leather industry (e.g. lacquering, coating)), accessory industry (e.g. manufacturing metal or plastic parts (zippers, buckles, etc.)).
- Fugitive emissions shall be minimized (e.g. by reducing evaporative losses). If not stated otherwise, fugitive emissions of VOCs shall be below 20%, with the goal of reduction to below 10% of total solvent input.
- A tailored off-gas abatement system considering BAT shall be installed and regularly maintained.
- The air emissions and efficiency of the off-gas abatement system (TOC and relevant substances: toluene (CAS 108-88-3), N,N-dimethylformamide (CAS 68-12-2), or any other CMR (Cat. 1A,1B or 2)) shall be measured at regular intervals.
 - Special case: TOC abatement efficiency monitoring for thermal oxidizers (TO) or regenerative thermal oxidizers (RTO) can be exempted if at least outlet TOC, CO (carbon monoxide) off gas emission and flame temperature are continuously monitored and respective monitoring systems are regularly maintained and calibrated.
- If relevant (especially if aqueous scrubbers are installed): Solvent concentrations in wastewater shall be measured.
- A management program defining appropriate budgets, responsibilities, actions and timelines shall ensure that the above-mentioned goals are achieved in due time.

6.1.1 VOC mass balance

The following data (annual mass flow values) shall be available for VOC mass balance determination (see also Figure 6.1):

- Input
 - Consumption of solvents and auxiliaries containing solvents
- Output
 - Off-gas emissions (contained emissions: e.g. stacks; can be treated and/or untreated)
 - Fugitive emissions (uncontained emissions: e.g. evaporative losses (e.g. to workplace atmosphere), leaks)
 - Solvents in final products (chemicals, articles)

A detailed description of a VOC mass balance is provided in the EU VOC Directive 1999/13 and the European Union Industrial Emission Directive IED 2010/75/EU.

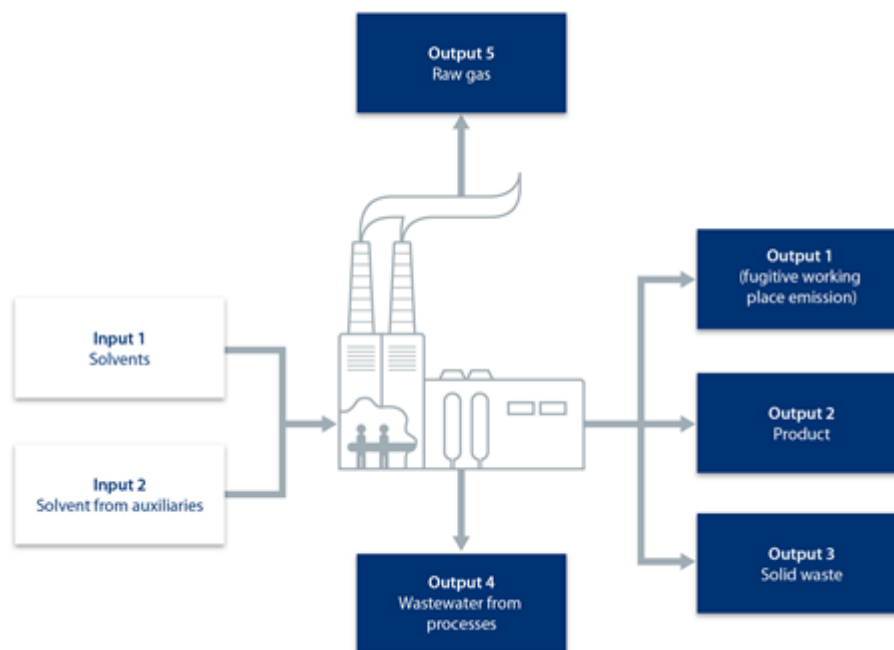


Figure 6.1: VOC mass balance (basic schematic diagram)

6.2 Prevention of major accidents hazards

Preventive measures shall be taken if the amount of stored organic substances exceeds the threshold limits defined in the *Guidance Sheet – Threshold limits for major accidents hazards* or the site is defined by local regulations as a major accidents hazard site:

- Concept for the prevention of major accidents
- Information to the local community
- Emergency preparedness plan coordinated with the local fire department

6.3 Process-specific requirements

6.3.1 Chemical industry

- Concentrated residuals shall be disposed of as solid waste
- VOC content in products shall be as low as possible (low VOC/high solid)
- Vapor balancing systems for tanks and reactors shall be used where possible
- Vapor-tight and solvent-resistant pumps, seals and flanges shall be used
- Emissions from tanks and reactors (e.g. during filling) shall be treated appropriately
- Fugitive emissions shall be minimized. Fugitive emissions of VOCs shall be below 5%, with the goal of reduction to below 3% of total solvent input

6.4 Manufacturing

6.4.1 Fiber manufacturing based on dry spinning and wet spinning

- The goal for recovery rate of fiber solvents shall be 99 % or more
- Compare emission limits in *bluesign® CRITERIA for production sites – Annex Fiber manufacturing*

6.4.2 Transfer paper printing

- Methanol (CAS 67-56-1) shall be replaced by ethanol (CAS 64-17-5)
- Use low-VOC/high-solid printing pastes
- Evaluate whether digital printing on paper can be used

6.4.3 Textile printing

- White spirit printing is not allowed
- Use low-VOC printing pastes
- Evaluate whether inkjet printing can be used

6.4.4 Solvent-based coating membrane manufacturing

- Phase out CMR (carcinogenic, mutagenic, reproduction toxic) solvents as toluene or N,N-Dimethylformamide
- Use low-VOC/high-solid pastes as much as possible
- Evaluate whether water-borne systems can be used

6.4.5 Painting and lacquering

- Reduce overspray and paint waste
- Use low-VOC/high-solid paint systems
- Use automated and enclosed spray painting and cleaning equipment where feasible
- Equip spray painting units with effective local exhaust ventilation (LEV) systems

6.4.6 Solvent based degreasing and paint stripping

Solvent based degreasing and paint stripping shall be conducted in fully closed equipment to reduce fugitive emissions and exposure of workers, especially if solvents with a low boiling point are used (e.g. dichloromethane (CAS 75-09-2)).

6.4.7 Footwear production

Solvent based adhesives are typically used in footwear production. SYSTEM PARTNER shall strive to keep VOC emissions below the target level of 25 g VOC per pair of shoes. Further, CMR (carcinogenic, mutagenic, reproduction toxic) solvents as toluene or N,N-Dimethylformamide shall be phased out.

6.4.8 Application of solvent based adhesives in assembly operations

Local exhaust ventilation (LEV) shall be used for the application of solvent based adhesives. Alternative bonding methods (e.g. hot melt adhesives or RF welding) shall be evaluated.

6.4.9 Textile dry cleaning

- Use solvents in fully closed and vapor-tight equipment
- Solvent recovery
- Check all requirements prescribed in the relevant guidance sheet

7 Validity

This document comes into effect from 2020-03. This newly introduced Annex summarizes and substantiates VOC-relevant topics. For all companies that signed an agreement for an assessment or for a bluesign® SYSTEM PARTNERSHIP before 2020-03 the newly introduced requirements are binding after a transition period of one year from the date of release.

This document is subject to revisions. Details on the revision procedure for regular and unscheduled revisions are compiled in the bluesign® SYSTEM document.

8 Other applicable documents

The following documents complement the present document:

- bluesign® SYSTEM
- bluesign® glossary
- bluesign® CRITERIA for production sites

- *bluesign® CRITERIA for production sites - Annex: Exclusion criteria*
- *bluesign® CRITERIA for production sites – Fiber manufacturing*
- *bluesign® SYSTEM BLACK LIMITS (BSBL) - Threshold limits for chemical substances in chemical products*
- *bluesign® SYSTEM SUBSTANCES LIST (BSSL) - Consumer safety limits*
- *Guidance Sheet – Threshold limits for major accidents hazards*
- *Guidance Sheet - CMR-Solvent Management*

Current versions are available for download at www.bluesign.com/criteria.

Disclaimer

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