**REGULATOR: North Tyneside Council**

**Review of an Environmental Permit for an Installation subject to Chapter II of the Industrial Emissions Directive under the Environmental Permitting (England & Wales) Regulations 2016 (as amended)**

**Decision document recording our decision-making process following review of a permit**

The Permit number is: NT/A2/001
The Operator is: Formica Limited
The Installation is: Formica, North Shields
This Variation Notice number is: 24/00003/VAREPR

## What this document is about

The Environmental Permitting Regulations (2016) requires the regulator to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards. We are required to ensure this is completed within four years of the publication of updated decisions on BAT conclusions. We will use BAT conclusions published by the European Commission for conclusions published before the UK leaves the EU, or UK BAT conclusions after the UK leaves the EU. The Environmental Permitting Regulations (2016) enables the objectives of the Industrial Emissions Directive (IED) to be met.

We have reviewed the permit for this installation against the revised BAT Conclusions for surface treatment using organic solvents (STS) including preservation of wood and wood products with chemicals industry sector (WPC) published on 9th December 2020. In this decision document, we set out the reasoning for the consolidated variation notice that we have issued.

It explains how we have reviewed and considered the techniques used by the Operator in the operation and control of the plant and activities of the installation. This review has been undertaken with reference to European Commission establishing best available techniques (BAT) conclusions ('BAT Conclusions') commission implementing decision (EU) 2020/2009, notified under document C(2020) 4050) establishing best available techniques (BAT) conclusions (BATc) for Surface treatment using organic solvents including preservation of wood and wood products with chemicals industry sector (STS). It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position.

As well as considering the review of the operating techniques used by the Operator for the operation of the plant and activities of the installation, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issue.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future.

## How this document is structured

| | |
|---|---|
| 1 | Our decision |
| 2 | How we reached our decision |
| 2.1 | Requesting information to demonstrate compliance with BAT Conclusions for STS |
| 2.2 | Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document |
| 3 | The legal framework |
| 4 | Annex 1 – Review of operating techniques within the Installation against BAT Conclusions. |
| 5 | Annex 2 – Review and assessment of changes that are not part of the BAT Conclusions derived permit review |

# Glossary of acronyms used in this document

| | |
|---|---|
| APC | Air Pollution Control |
| BAT | Best Available Technique(s) |
| BAT-AEEL | BAT Associated Energy Efficiency Level |
| BAT-AEL | BAT Associated Emission Level |
| BATc | BAT conclusion |
| BREF | Best available techniques reference document |
| CEM | Continuous emissions monitor |
| DLN | Dry Low NOx burners |
| ELV | Emission limit value derived under BAT or an emission limit value set out in IED |
| EMS | Environmental Management System |
| EPR | Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) |
| IC | Improvement Condition |
| IED | Industrial Emissions Directive (2010/75/EU) |
| IPPCD | Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED |
| NOx | Oxides of nitrogen (NO plus $NO_2$ expressed as $NO_2$) |
| SGN | Sector guidance note |
| TGN | Technical guidance note |

# 1 Our decision

We have decided to issue the Variation Notice to the Operator. This will allow it to continue to operate the Installation, subject to the conditions in the Consolidated Variation Notice that updates the whole permit.

We consider that, in reaching our decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

# 2 How we reached our decision

## 2.1 Requesting information to demonstrate compliance with BAT Conclusion techniques

We issued a Notice under regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 10/08/2021 requiring the Operator to provide information to demonstrate where the operation of their installation currently meets, or how it will subsequently meet, the revised standards described in the relevant BAT Conclusions document.

The Notice required that where the revised standards are not currently met, the operator should provide information that

- Describes the techniques that will be implemented before 9/12/2024, which will then ensure that operations meet the revised standard, or
- justifies why standards will not be met by 9/12/2024, and confirmation of the date when the operation of those processes will cease within the installation or an explanation of why the revised BAT standard is not applicable to those processes, or
- Justifies why an alternative technique will achieve the same level of environmental protection equivalent to the revised standard described in the BAT Conclusions.

Where the Operator proposed that they were not intending to meet a BAT standard that also included a BAT Associated Emission Level (BAT AEL) described in the BAT Conclusions Document, the Regulation 61 Notice required that the Operator make a formal request for derogation from compliance with that AEL. In this circumstance, the Notice identified that any such request for derogation must be supported and justified by sufficient technical and commercial information that would enable us to determine acceptability of the derogation request.
The Regulation 61 Notice response from the Operator was received on 09/02/2022.

The Operator made no claim for commercial confidentiality. We have not received any information in relation to the Regulation 61 Notice response that appears to be confidential in relation to any party.

2.2 Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document

Based on our records and previous experience in the regulation of the installation we have no reason to consider that the operator will not be able to comply with the techniques and standards described in the BAT Conclusions.

# 3 The legal framework

The Consolidated Variation Notice will be issued, under Regulations 18 and 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* as described by the IED;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that, in issuing the Consolidated Variation Notice, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

## Annex 1: Decision checklist regarding relevant BAT Conclusions

BAT Conclusions for Surface treatment using organic solvents including preservation of wood and wood products with chemicals industry sector, were published on 9th December 2020. There are 29 STS BAT Conclusions BAT and 22 BATc for Preservation of Wood and Wood Products with Chemicals.

This annex provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the Consolidated Variation Notice.

The conditions in the permit through which the relevant BAT Conclusions are implemented include but are not limited to the following:

| **BAT Conclusion requirement/topic** | **Permit condition(s)** | **Permit table(s)** |
|---|---|---|
| BAT 1 - Environmental Management System | 1.1.1, 2.3.3 | S1.2 |
| BAT 19 Energy efficiency | 1.2 and 2.3.3 | S4.3 |
| BAT 6 Use of Raw Materials | 1.3.1 and 2.3.3 | S1.2 , S2.1 |
| BAT 22 - Avoidance, recovery and disposal of wastes produced by the activities | 1.4, 2.3.5 and 2.3.6 | |
| BAT AELs | 3.1.1, 3.1.3 and 3.5.1 | S3.1, Table S3.3 Annual limits for total and fugitive emissions |
| Monitoring | 2.3 and 3.3 | S3.1, S3.2, S3.3 and S3.4 |
| Other than Normal Operating (OTNOC) and Accidents | 3.1.5 | |
| Odour | 3.4 and 2.3 | S1.2 |
| Noise | 3.5 | S1.2 |
| Other operating techniques | 2.3 | S1.2 |

The overall status of compliance with the BAT conclusion is indicated in the table as

NA Not Applicable
CC Currently Compliant
FC Compliant in the future (within 4 years of publication of BAT conclusions)
NC Not Compliant

| BAT Conclusion No | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C / FC / NC | Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement |
|---|---|---|---|
| | BAT Conclusions that are not applicable to this installation | **NA** | This installation undertakes surface treatment using organic solvents including preservation of wood and wood products with chemicals therefore sections do not apply:<br><br>Section 1.2 BAT conclusions for the coating of vehicles , BAT 24 , Tables 7 and 8<br>Section 1.3 BAT conclusions for the coating of other metal and plastic surfaces Tables 9, 10 & 11<br>Section 1.4 - BAT conclusions for the coating of ships and yachts BAT 25 & Table 12<br>Section 1.5- BAT conclusions for the coating of aircraft BAT 26 & Table 13<br>Section 1.6 BAT conclusions for coil coating and Tables 14 &15<br>Section 1.7 BAT conclusions for the manufacturing of adhesive tapes Tables 16 &17<br>Section 1.9 BAT conclusions for the manufacturing of winding wire (BAT 27) Tables 20 & 21<br>Section 1.10 BAT conclusions for the coating and printing of metal packaging Tables 22, 23 & 24<br>Section 1.11 BAT conclusions for heatset web offset printing (BAT 28) tables 25, 26 &27 |

| BAT Conclusion No | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C / FC / NC | Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement |
|---|---|---|---|
| | | | Section 1.12 BAT conclusions for flexography and non-publication rotogravure printing Table 28, 29 &30<br>Section 1.13 BAT conclusions for publication rotogravure printing ( BAT 29) and Tables 31 & 32<br>Section 1.14 BAT conclusions for the coating of wooden surfaces including Tables 33, 34 & 35<br><br>BATc 30-53 FOR PRESERVATION OF WOOD AND WOOD PRODUCTS WITH CHEMICALS |
| | BAT Conclusions where we accept the operator's Reg 61 notice response that they are currently compliant and no further explanation is required. | **CC** | BAT Conclusions for the surface treatment using organic solvents including preservation of wood and wood products with chemicals<br>Section 1.8 BAT conclusions for the coating of textiles, foils and paper Tables 18&19 |
| | BAT Conclusions where improvements will be undertaken on site within the 4 year period in order to achieve compliance with | **NA** | |

| BAT Conclusion No | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C / FC / NC | Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement |
|---|---|---|---|
| | the narrative and/or BATAEL prior to the 4 year deadline | | |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| 1 | **In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:**<br><br>i) commitment, leadership, and accountability of the management, including senior management, for the implementation of an effective EMS;"<br>ii) an analysis that includes the determination of the organisation's context, the identification of the needs and expectations of interested parties, the identification of characteristics of the installation that are associated with possible risks for the environment (or human health) as well as of the applicable legal requirements relating to the environment;<br>iii) development of an environmental policy that includes the continuous improvement of the environmental performance of the installation;<br>iv) establishing objectives and performance indicators in relation to significant environmental aspects, including safeguarding compliance with applicable legal requirements;<br>v) planning and implementing the necessary procedures and actions (including corrective and preventive actions where needed), to achieve the environmental objectives and avoid environmental risks;<br>vi) determination of structures, roles and responsibilities in relation to environmental aspects and objectives and provision of the financial and human resources needed;<br>vii) ensuring the necessary competence and awareness of staff whose work may affect the environmental performance of the installation (e.g. by providing information and training);<br>viii) internal and external communication;<br>ix) fostering employee involvement in good environmental management practices;<br>x) Establishing and maintaining a management manual and written procedures to control activities with significant environmental impact as well as relevant records;<br>xi) effective operational planning and process control;<br>xii) implementation of appropriate maintenance programmes;<br>xiii) emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations;<br>xiv) when (re)designing a (new) installation or a part thereof, consideration of its environmental impacts throughout its life, which includes construction, maintenance, operation and decommissioning;<br>xv) implementation of a monitoring and measurement programme, if necessary, information can be found in the Reference Report on Monitoring of Emissions to Air and Water from IED Installations;<br>xvi) application of sectoral benchmarking on a regular basis;<br>xvii) periodic independent (as far as practicable) internal auditing and periodic independent external auditing in order to assess the environmental performance and to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; | **CC** | An EMS is in place which the Operator has confirmed is compliant with the requirements listed in BAT 1. The EMS is certified to ISO 14001:2015.<br>The EMS also incorporates a maintenance programme to reduce the frequency and environmental consequences of OTNOC (see BAT 13); an energy efficiency plan (BAT 19 (a));<br>a water management plan (BAT 20 (a));<br>a waste management plan (BAT 22 (a)) and<br>an odour management plan (BAT 23). |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | xviii) evaluation of causes of nonconformities, implementation of corrective actions in response to nonconformities, review of the effectiveness of corrective actions, and determination of whether similar nonconformities exist or could potentially occur;<br>xix) periodic review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;<br>xx) following and taking into account the development of cleaner techniques.<br><br>**Specifically for surface treatment using organic solvents, BAT is also to incorporate the following features in the EMS:**<br><br>(i) Interaction with quality control and assurance as well as health and safety considerations.<br>(ii) Planning to reduce the environmental footprint of an installation. In particular, this involves the following:<br>(a) assessing the overall environmental performance of the plant (see BAT 2);<br>(b) taking into account cross-media considerations, especially the maintenance of a proper balance between solvent emissions reduction and consumption of energy (see BAT 19), water (see BAT 20) and raw materials (see BAT 6);<br>(c) reducing VOC emissions from cleaning processes (see BAT 9).<br>(iii) The inclusion of:<br>(a) a plan for the prevention and control of leaks and spillages (see BAT 5 (a));<br>(b) a raw material evaluation system to use raw materials with low environmental impact and a plan to optimise the use of solvents in the process (see BAT 3);<br>(c) a solvent mass balance (see BAT 10);<br>(d) a maintenance programme to reduce the frequency and environmental consequences of OTNOC (see BAT 13);<br>(e) an energy efficiency plan (see BAT 19 (a));<br>(f) a water management plan (see BAT 20 (a));<br>(g) a waste management plan (see BAT 22 (a));<br>(h) an odour management plan (see BAT 23). | | |
| 2 | BAT 2. In order to improve the overall environmental performance of the plant, in particular concerning VOC emissions and **energy consumption**, BAT is to:<br>— identify the process areas/sections/steps that represent the greatest contribution to the VOC emissions and energy consumption and the greatest potential for improvement (see also BAT 1);<br>— identify and implement actions to minimise VOC emissions and energy consumption;<br>— regularly (at least once every year) update the situation and follow up the implementation of the identified actions. | **CC** | The operator has identified the areas of greatest VOC emissions and considered techniques to minimise those emissions and reduce energy consumption. Condition 1.2 requires |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td></td><td></td><td>the operator regularly review energy efficiency to reduce emissions.</td></tr>
<tr><td>3</td><td>BAT 3. In order to prevent or reduce the environmental impact of the raw materials used, BAT is to use BOTH of the techniques given below.
<table>
<tr><th>Technique</th><th>Applicability</th></tr>
<tr><td>(a) Use of raw materials with a low environmental impact As part of the EMS (see BAT 1), systematic evaluation of the adverse environmental impacts of the materials used (in particular substances that are carcinogenic, mutagenic and toxic to reproduction as well as substances of very high concern) and substitution by others with no or lower environmental and health impacts where possible, taking into consideration the product quality requirements or specifications.</td><td>Generally applicable. The scope (e.g. level of detail) and nature of the evaluation will generally be related to the nature, scale and complexity of the plant and the range of environmental impacts it may have, as well as to the type and quantity of materials used.</td></tr>
<tr><td>(b) Optimisation of the use of solvents in the process Optimisation of the use of solvents in the process by a management plan (as part of the EMS (see BAT 1)) that aims to identify and implement necessary actions (e.g. colour batching, optimising spray pulverisation).</td><td>Generally applicable.</td></tr>
</table></td><td>CC</td><td>The operator has confirmed that a management of change process is in place to consider raw materials and their associated environmental impact. Condition 1.3 of the permit covers operator responsibilities in relation to raw material consumption.</td></tr>
<tr><td>4</td><td>In order to reduce solvent consumption, VOC emissions and the overall environmental impact of the raw materials used, BAT is to use one or a combination of the techniques given below.<br>(a) Use of high-solids solvent-based paints/coatings/ varnishes/inks/ adhesives<br>(b) Use of water-based paints/coatings/inks/ varnishes/adhesives<br>(c) Use of radiation-cured inks/coatings/paints/ varnishes/adhesives<br>(d) Use of solvent-free two-component adhesives<br>(e) Use of hot-melt adhesives<br>(f) Use of powder coatings<br>(g) Use of laminate film for web or coil coatings<br>(h) Use of substances which are not VOCs or are VOCs of a lower volatility</td><td>CC</td><td>The operator has confirmed techniques including use of high solids solvent based coatings and use of laminate film where possible to reduce solvent consumption.</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| 5 | In order to prevent or reduce fugitive emissions during storage and handling of solvent-containing materials and/or hazardous materials, BAT is to apply the principles of good housekeeping by using **ALL** of the techniques given below.<br><br>**Management techniques**<br>**(a) Preparation and implementation of a plan for the prevention and control of leaks and spillages**<br><br>A plan for the prevention and control of leaks and spillages is part of the EMS (see BAT 1) and includes, but is not limited to:<br>• site incident plans for small and large spillages;<br>• identification of the roles and responsibilities of persons involved;<br>• ensuring staff are environmentally aware and trained to prevent/deal with spillage incidents;<br>• identification of areas at risk of spillage and/or leaks of hazardous materials and ranking them according to the risk;<br>• in identified areas, ensuring suitable containment systems are in place, e.g. impervious floors;<br>• identification of suitable spillage containment and clean-up equipment and regularly ensuring it is available, in good working order and close to points where these incidents may occur;<br>• waste management guidelines for dealing with waste arising from spillage control;<br>• regular (at least once per year) inspections of storage and operational areas, testing and calibration of leak detection equipment and prompt repair of leaks from valves, glands, flanges, etc. (see BAT 13).<br>**Storage Techniques:**<br>(b) Sealing or covering of containers and bunded storage area - Storage of solvents, hazardous materials, waste solvents and waste cleaning materials in sealed or covered containers, suitable for the associated risk and designed to minimise emissions. The containers' storage area is bunded and of adequate capacity.<br>(c) Minimisation of storage of hazardous materials in production areas - Hazardous materials are present in production areas only in amounts that are necessary for production; larger quantities are stored separately.<br>**Techniques to prevent leaks and spillages** | **cc** | The operator has indicated that good housekeeping is in place to meet compliance with BAT for reducing fugitive emissions. These include the application of the EMS, spill control plans, use of secure and bunded areas, use of covered containers, transfer systems are typically automatic with high level trip switches and when handling solvent-containing materials in containers, possible spills are avoided by providing containment, e.g. by using trolleys, pallets and/or stillages with built-in containment and/or rapid take-up by using absorbent materials. Condition 1.1 details requirements on general management. |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>(d) Leaks and spillages are prevented by using pumps and seals suitable for the material handled and which ensure proper tightness. This includes equipment such as canned motor pumps, magnetically coupled pumps, pumps with multiple mechanical seals and a quench or during pumping, buffer system, pumps with multiple mechanical seals and seals dry to atmosphere, diaphragm pumps or bellow pumps.<br>Techniques for pumping and handling liquids<br>(e) Techniques to prevent overflows during pumping<br>This includes ensuring for example that:<br>• the pumping operation is supervised;<br>• for larger quantities, bulk storage tanks are fitted with acoustic and/or optical high-level alarms, with shut-off systems if necessary.<br>(f) Capture of VOC vapour during solvent containing material delivery - When delivering solvent-containing materials in bulk (e.g. loading or unloading of tanks), the vapour displaced from receiving tanks is captured, usually by back-venting.<br>(g) Containment for spills and/or rapid take-up when handling solvent containing materials - When handling solvent-containing materials in containers, possible spills are avoided by providing containment, e.g. by using trolleys, pallets and/or stillages with built-in containment (e.g. ‘catch pans’) and/or rapid take-up by using absorbent materials.</td><td></td><td></td></tr>
<tr><td>6</td><td>In order to reduce raw material consumption and VOC emissions, BAT is to use one or a combination of the techniques given below.<br><table><tr><th>Technique</th><th>Description</th><th>Applicability</th></tr><tr><td>(a) Centralised supply of VOC-containing materials (e.g. inks, coatings, adhesives, cleaning agents)</td><td>Supply of VOC-containing materials (e.g. inks, coatings, adhesives, cleaning agents) to the application area by direct piping with ring lines, including system cleaning such as pig cleaning or air flushing. May not be applicable in the case of frequent changes of inks/paints/ coatings/adhesives or solvents.</td><td>May not be applicable in the case of frequent changes of inks/paints/ coatings/adhesives or solvents.</td></tr><tr><td>(b) Advanced mixing systems.</td><td>Computer-controlled mixing equipment to achieve the desired paint/coating/ink/adhesive</td><td>Generally Applicable</td></tr></table></td><td>cc</td><td>The operator has confirmed that they use a combination of these techniques including centralisation of the supply of resins hard piped to the point of use and automated batch process equipment on all resin treaters to meet requirements of BAT.</td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>(c) Supply of VOC-containing materials (e.g. inks, coatings, adhesives, cleaning agents) at the point of application using a closed system</td><td>In the case of frequent changes of inks/paints/ coatings/adhesives and solvents or for small-scale usage, supply of inks/paints/coatings/adhesives and solvents from small transport containers placed near the application area using a closed system.</td><td>Generally Applicable</td></tr>
<tr><td>(d) Automation of colour change</td><td>Automated colour changing and ink/paint/coating line purging with solvent capture</td><td>Generally Applicable</td></tr>
<tr><td>(e) Colour grouping</td><td>Modification of the sequence of products to achieve large sequences with the same colour.</td><td>Generally Applicable</td></tr>
<tr><td>(f) Soft purge in spraying</td><td>Refilling the spray gun with new paint without intermediate rinsing.</td><td>Generally Applicable</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>7</td><td>BAT 7. In order to reduce raw material consumption and the overall environmental impact of the coating application processes, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td colspan="3">Techniques for non-spraying application</td></tr>
<tr><td>(a) Roller coating</td><td>Application where rollers are used to transfer or meter the liquid coating onto a moving strip.</td><td>Only applicable to flat substrates (1)</td></tr>
<tr><td>(b) Doctor blade over roller</td><td>The coating is applied to the substrate through a gap between a blade and a roller. As the coating and substrate pass, the excess is scraped off.</td><td>Generally applicable (1)</td></tr>
<tr><td>(c) No-rinse (dry-in-place) application in the coating of coil</td><td>Application of conversion coatings which do not require a further water rinse using a roller coater (chemcoater) or squeegee rollers.</td><td>Generally applicable (1)</td></tr>
</table>
</td><td>cc</td><td>The operator has confirmed that they use roller coatings and doctor blade over roller techniques within their process to reduce raw material consumption.</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | (d) Curtain coating (casting) | Work-pieces are passed through a laminar film of coating discharged from a header tank | Only applicable to flat substrates (1) | | |
| | (e) Electrocoating (e-coat) | Paint particles dispersed in a water-based solution are deposited on immersed substrates under the influence of an electric field (electrophoretic deposition). | Only applicable to metal substrates (1). | | |
| | (f) Flooding | The work-pieces are transported via conveyor systems into a closed channel, which is then flooded with the coating material via injection tubes. The excess material is collected and reused. | Generally applicable (1) | | |
| | (g) Co-extrusion | The printed substrate is coupled with a warm, liquefied plastic film and subsequently cooled down. This film replaces the necessary additional coating layer. It may be used between two different layers of different carriers acting as an adhesive | Not applicable where high bond strength or resistance to sterilisation temperature is needed (1) | | |
| | **Spraying atomisation techniques** | | | | |
| | (h) Air-assisted airless spraying | An airflow (shaping air) is used to modify the spray cone of an airless spray gun. | Generally applicable (1) | | |
| | (i) Pneumatic atomisation with inert gases | Pneumatic paint application with pressurised inert gases (e.g. nitrogen, carbon dioxide). | May not be applicable to coating of wooden surfaces (1). | | |
| | (j) High-volume low-pressure (HVLP) atomisation | Atomisation of paint in a spray nozzle by mixing paint with high volumes of air with a low pressure (max. 1,7 bar). HVLP guns have a paint transfer efficiency of > 50 %. Generally applicable (1). | Generally applicable (1) | | |
| | (k) Electrostatic atomisation (fully automated) | Atomisation by high-speed rotational discs and bells and shaping the spray jet with electrostatic fields and shaping air. | Generally applicable (1) | | |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>(l) Electrostatically assisted air or airless spraying</td><td>Shaping the spray jet of pneumatic or airless atomisation with an electrostatic field. Electrostatic paint guns have a transfer efficiency of > 60 %. Fixed electrostatic methods have a transfer efficiency of up to 75 %</td><td>Generally applicable (1)</td></tr>
<tr><td>(m) Hot spraying</td><td>Pneumatic atomisation with hot air or heated paint.</td><td>May not be applicable for frequent colour changes (1).</td></tr>
<tr><td>(n) ‘Spray, squeegee and rinse’ application in the coating of coil</td><td>Sprays are used for application of cleaners, pre-treatments and for rinsing. After spraying, squeegees are used to minimise solution dragout, which is followed by rinsing.</td><td>Generally applicable (1)</td></tr>
<tr><td colspan="3">Automation of spray application</td></tr>
<tr><td>(o) Robot application</td><td>Robot application of coatings and sealants to internal and external surfaces</td><td>Generally applicable (1)</td></tr>
<tr><td>(p) Machine application</td><td>Use of paint machines for the handling of the spray head/spray gun/nozzle.</td><td>Generally applicable (1)</td></tr>
<tr><td colspan="3">(1) The selection of the application techniques may be restricted at plants with low throughput and/or high product variety as well as by the substrate type and shape, product quality requirements and the need to ensure that the materials used, coating application techniques, drying/curing techniques and off-gas treatment systems are mutually compatible</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>8</td><td>Drying/curing - BAT 8. In order to reduce energy consumption and the overall environmental impact from drying/curing processes, BAT is to use one or a combination of the techniques given below.
<table>
<tr><td>Technique</td><td>Description</td><td>Applicability</td></tr>
<tr><td>(a) Inert gas convection drying/curing</td><td>The inert gas (nitrogen) is heated in the oven, enabling solvent loading above the LEL. Solvent loads of > 1 200 g/m3 nitrogen are possible.</td><td>Not applicable where dryers need to be opened regularly (1).</td></tr>
<tr><td>(b) Induction drying/curing</td><td>Online thermal curing or drying by electromagnetic inductors that generate heat inside the metallic work-piece by an oscillating magnetic field.</td><td>Only applicable to metal substrates (1).</td></tr>
</table>
</td><td>CC</td><td>The process uses technique f convention drying/curing with heat recovery to reduce energy consumption. The exhaust fumes from the impregnation oven is ducted to the RTO thermal oxidiser. The solvent laden air is drawn into the oxidiser where it is heated to around 800°C, at which temperature the destruction of the volatile organic compounds</td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>(c) Microwave and high- frequency drying</td><td>Drying using microwave or high-frequency radiation.</td><td>Only applicable to water-based coatings and inks and non-metallic substrates</td></tr>
<tr><td>(d) Radiation curing</td><td>Radiation curing is applied based on resins and reactive diluents (monomers) which react on exposure to radiation (infrared (IR), ultraviolet (UV)), or high-energy electron beams (EB).</td><td>Only applicable to specific coatings and inks (1)</td></tr>
<tr><td>(e) Combined convection/IR radiation drying</td><td>Drying of a wet surface with a combination of circulating hot air (convection) and an infrared radiator.</td><td>Generally applicable (1).</td></tr>
<tr><td>(f) Convection drying/curing combined with heat recovery</td><td>Heat from off-gases is recovered (see BAT 19 (e)) and used to preheat the input air of the convection dryer/curing oven.</td><td>Generally applicable (1).</td></tr>
<tr><td colspan="3">(1) The selection of the drying/curing techniques may be restricted by the substrate type and shape, product quality requirements and the need to ensure that the materials used, coating application techniques, drying/curing techniques and off-gas treatment systems are mutually compatible.</td></tr>
</table>
</td><td></td><td>(VOC’s) takes place. To maintain this temperature in the main chamber the solvent in the air stream is burnt along with the gas fired burners to maintain the optimum temperature. The resultant exhaust air emitted from the oxidiser is used to minimise gas consumption within the RTO. Condition 1.2 covered the requirements for energy efficiency and management.</td></tr>
<tr><td>9</td><td>Cleaning processes - BAT 9. In order to reduce VOC emissions from cleaning processes, BAT is to minimise the use of solvent-based cleaning agents and to use a combination of the techniques given below.
<table>
<tr><td>Technique</td><td>Description</td><td>Applicability</td></tr>
<tr><td>(a) Protection of spraying areas and equipment</td><td>Application areas and equipment (e.g. spray booth walls and robots) susceptible to overspray and drips, etc. are covered with fabric covers or disposable foils where foils are not subject to tearing or wear.</td><td rowspan="2">The selection of cleaning techniques may be restricted by the type of process, the substrate or equipment to be cleaned and the type of contamination.</td></tr>
<tr><td>(b) Solids removal prior to complete cleaning</td><td>Solids are removed in a (dry) concentrated form, usually by hand, with or without the aid of small amounts of cleaning solvent. This reduces the amount of material to be removed by solvent and/or water in subsequent</td></tr>
</table>
</td><td>cc</td><td>The process does not involve spraying. A combination of techniques are used to reduce VOC emissions during cleaning. Solids are removed from rollers prior to cleaning. At resin changeover, the machine’s cylinders and rollers are cleaned using solvent. The rollers are cleaned by hand using material wipes, which are stored in a sealed drum and disposed of as hazardous waste via a reputable supplier.</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | | cleaning stages, and therefore the amount of solvent and/or water used. | | | |
| | (c) Manual cleaning with pre-impregnated wipes | Wipes pre-impregnated with cleaning agents are used for manual cleaning. Cleaning agents may be solvent-based, low-volatility solvents or solvent- free. | | | |
| | (d) Use of low-volatility cleaning agents | Application of low-volatility solvents as cleaning agents, for manual or automated cleaning, with high cleaning power. | | | |
| | (e) Water-based cleaning | Water-based detergents or water-miscible solvents such as alcohols or glycols are used for cleaning. | | | |
| | (f) Enclosed washing machines | Automatic batch cleaning/degreasing of press/machine parts in enclosed washing machines. This can be done using either:<br>(a) organic solvents (with air extraction followed by VOC abatement and/or recovery of the used solvents) (see BAT 15); or<br>(b) VOC-free solvents; or<br>(c) alkaline cleaners (with external or internal waste water treatment). | | | |
| | (g) Purging with solvent recovery | Collection, storage and, if possible, reuse of the solvents used to purge the guns/applicators and lines between colour changes. | | | |
| | (h) Cleaning with high- pressure water spray | High-pressure water spray and sodium bicarbonate systems or similar are used for automatic batch cleaning of press/machine parts. | | | |
| | (i) Ultrasonic cleaning | Cleaning in a liquid using high-frequency vibrations to loosen the adhered contamination. | | | |
| | (j) Dry ice (CO2) cleaning | Cleaning of machinery parts and metallic or plastic substrates by blasting with $CO_2$ chips or snow. | | | |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>(k) Plastic shot-blast cleaning</td><td>Excess paint build-up is removed from panel jigs and body carriers by shot-blasting with plastic particles.</td><td></td></tr>
<tr><td colspan="3">(1) The selection of the drying/curing techniques may be restricted by the substrate type and shape, product quality requirements and the need to ensure that the materials used, coating application techniques, drying/curing techniques and off-gas treatment systems are mutually compatible.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>10</td><td>BAT is to monitor total and fugitive VOC emissions by compiling, at least once every year, a solvent mass balance of the solvent inputs and outputs of the plant, as defined in Part 7(2) of Annex VII to Directive 2010/75/EU and to minimise the uncertainty of the solvent mass balance data by using all of the techniques given below.
<table>
<tr><th>Technique</th><th>Description</th></tr>
<tr><td>(a) Full identification and quantification of the relevant solvent inputs and outputs, including the associated uncertainty</td><td>This includes:<br>— identification and documentation of solvent inputs and outputs (e.g. emissions in waste gases, emissions from each fugitive emission source, solvent output in waste);<br>— substantiated quantification of each relevant solvent input and output and recording of the methodology used (e.g. measurement, calculation using emission factors, estimation based on operational parameters);<br>— identification of the main sources of uncertainty of the aforementioned quantification, and implementation of corrective actions to reduce the uncertainty;<br>— regular update of solvent input and output data.</td></tr>
<tr><td>(b) Implementation of a solvent tracking system</td><td>A solvent tracking system aims to keep control of both the used and unused quantities of solvents (e.g. by weighing unused quantities returned to storage from the application area).</td></tr>
<tr><td>(c) Monitoring of changes that may influence the uncertainty</td><td>Any change that could influence the uncertainty of the solvent mass balance data is recorded, such as:</td></tr>
</table>
</td><td>CC</td><td>See also response to BAT.<br><br>The operator has confirmed that a solvent mass balance is used to identify and quantify solvent inputs and outputs. The solvent inventory is maintained through the site’s purchasing and stock control system. Deliveries are organised daily in order to minimise stock held on site. Condition 4.2.5 requires the annual submission of the solvent management plan to demonstrate compliance.</td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>of the solvent mass balance data.</td><td>— malfunctions of the off-gas treatment system: the date and duration are recorded;<br>— changes that may influence air/gas flow rates, e.g. replacement of fans, drive pulleys, motors; the date and type of change are recorded.</td></tr>
</table>
Applicability The level of detail of the solvent mass balance will be proportionate to the nature, scale and complexity of the installation, and the range of environmental impacts it may have, as well as to the type and quantity of materials used.
</td><td></td><td></td></tr>
<tr><td>11</td><td>BAT is to monitor emissions in waste gases with at least the frequency given below and in accordance with EN standards.
<table>
<tr><th>Substance/ Parameter</th><th>Sectors/Sources</th><th>Standard(s)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td>Dust</td><td>• Coating of vehicles – Spray coating<br>• Coating of other metal and plastic surfaces – Spray coating<br>• Coating of aircraft – Preparation (e.g. sanding, blasting) & coating<br>• Coating and printing of metal packaging – Spray application<br>• Coating of wooden surfaces – Preparation and coating</td><td>EN 13284-1</td><td>Once every year (1)</td><td>BAT 18</td></tr>
<tr><td></td><td>Any stack with a TVOC load < 10 kg C/h</td><td>EN 12619</td><td>Once every year (1) (2)(3)</td><td>BAT 14, BAT 15</td></tr>
</table>
</td><td>CC</td><td>Monitoring is undertaken as described in Table S3.1a</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| TVOC | All sectors | Any stack with a TVOC load ≥ 10 kg C/h | Generic EN standards (4) | Continuous | |
| DMF | Coating of textiles, foils and paper (5) | | No EN standard available (6) | Once every 3 months(1) | BAT 15 |
| NOX | Thermal treatment of off-gases | | EN 14792 | Once every year (7) | BAT 17 |
| CO | Thermal treatment of off-gases | | EN 15058 | Once every year (7) | BAT 17 |

(1) To the extent possible, the measurements are carried out at the highest expected emission state under normal operating conditions.
(2) In the case of a TVOC load < 0.1 kg C/h, or in the case of an unabated and stable TVOC load of < 0.3 kg C/h, the monitoring frequency may be reduced to once every 3 years or the monitoring may be replaced by calculation provided that it ensures the provision of data of an equivalent scientific quality.
(3) For the thermal treatment of off-gases, the temperature in the combustion chamber is continuously measured. This is combined with an alarm system for temperatures falling outside the optimised temperature window.
(4) Generic EN standards for continuous measurements are EN15267-1, EN15267-2, EN15267-3 & EN14181.
(5) The monitoring only applies if DMF is used in the processes.
(6) In the absence of an EN standard, the measurement includes the DMF contained in the condensed phase.
(7) In the case of a stack with a TVOC load of < 0.1 kg C/h, the monitoring frequency may be reduced to once every three years.

| | | | | |
|---|---|---|---|---|
| 12 | BAT is to monitor emissions to water with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality. | **NA** | Not applicable to this process. |

| Substance/ Parameter | Sector | Standard(s) |
|---|---|---|

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | TSS (1) | Coating of vehicles<br>Coil coating<br>Coating and printing of metal packaging (only for DWI cans) | EN 872 | | |
| | COD (1) (4) | Coating of vehicles<br>Coil coating<br>Coating and printing of metal packaging (only for DWI cans) | No EN standard available | | |
| | | Coating of vehicles<br>Coil coating<br>Coating and printing of metal packaging (only for DWI cans) | EN 1484 | | |
| | Cr(VI) (5) (6) | Coating of aircraft Coil coating | EN ISO 10304-3 or EN ISO 23913 | | |
| | Cr (6) (7) | Coating of aircraft<br>Coil coating | Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586) | | |
| | Ni (6) | Coating of vehicles<br>Coil coating | Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586) | | |
| | Zn (6) | Coating of vehicles<br>Coil coating | Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586) | | |
| | AOX | Coating of vehicles<br>Coil coating<br>Coating and printing of metal packaging (only for DWI cans) | EN ISO 9562 | | |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | <table><tr><td>F- (6) (8)</td><td>Coating of vehicles Coil coating<br>Coating and printing of metal packaging (only for DWI cans)</td><td>EN ISO 10304-1</td></tr></table><br>Note: monitoring frequency is “Once every month” see footnotes (2) (3) & Monitoring associated with BAT 21<br>Footnotes:<br>(1) The monitoring only applies in the case of direct discharge to a receiving water body.<br>(2) The monitoring frequency may be reduced to once every 3 months if the emission levels are proven to be sufficiently stable.<br>(3) In the case of batch discharge that is less frequent than the minimum monitoring frequency, monitoring is carried out once per batch.<br>(4) TOC monitoring and COD monitoring are alternatives. TOC monitoring is the preferred option because it does not rely on the use of very toxic compounds.<br>(5) Monitoring of Cr(VI) only applies if chromium(VI) compounds are used in the processes.<br>(6) In the case of indirect discharge to a receiving water body, the monitoring frequency may be reduced if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned.<br>(7) Monitoring of Cr only applies if chromium compounds are used in the processes.<br>(8) Monitoring of F- only applies if fluorine compounds are used in the processes. | | |
| 13 | In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions during OTNOC, BAT is to use both of the techniques given below.<br><br>(a) Identification of critical equipment - Equipment critical to the protection of the environment (‘critical equipment’) is identified on the basis of a risk assessment. In principle, this concerns all equipment and systems handling VOCs (e.g. off-gas treatment system, leak detection system).<br>(b) Inspection, maintenance and monitoring - A structured programme to maximise critical equipment availability and performance which includes standard operating procedures, preventive maintenance, regular and unplanned maintenance. OTNOC periods, duration, causes and, if possible, emissions during their occurrence are monitored. | **CC** | The plant and associated control systems have been designed to minimise the potential for OTNOC events to occur.<br><br>All plant & equipment at the site is regularly maintained including those systems provided to minimise the potential for OTNOC conditions to occur. Maintenance works at the site are scheduled using the maintenance software system. The site have qualified maintenance |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | | | contractors who carry out the maintenance works regularly. |
| 14 | BAT 14. In order to reduce VOC emissions from the production and storage areas, BAT is to use technique (a) and an appropriate combination of the other techniques given below.<br><br>**(a) System selection, design and optimisation**<br>An off-gas system is selected, designed and optimised taking into account parameters such as:<br>• -amount of extracted air;<br>• -type and concentration of solvents in extracted air;<br>• -type of treatment system (dedicated/ centralised);<br>• -health and safety;<br>• -energy efficiency.<br>The following order of priority for the system selection may be considered:<br>• segregation of off-gases with high and low VOC concentrations;<br>• techniques to homogenise and increase the VOC concentration (see BAT 16 (b) and (c));<br>• techniques for the recovery of solvents in off- gases (see BAT 15);<br>• VOC abatement techniques with heat recovery (see BAT 15);<br>• VOC abatement techniques without heat recovery (see BAT 15) System selection, design and optimisation<br>Generally applicable.<br><br>**(b) Air extraction as close as possible to the point of application of VOC- containing materials**<br>Air extraction as close as possible to the point of application with full or partial enclosure of solvent application areas (e.g. coaters, application machines, spray booths). Extracted air may be treated by an off-gas treatment system. May not be applicable where enclosure leads to difficult machinery access during operation. Applicability may be restricted by the shape and size of the area to be enclosed.<br><br>**(c) Air extraction as close as possible to the point of preparing paints/coatings/adhesives/inks** | **CC** | The process utilises a dedicated RTO to reduce VOC emissions and comply with the requirements of BAT14.<br>Extraction is provided from the enclosed impregnation area with the off gas being recovered into the process. |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | Air extraction as close as possible to the point of preparing paints/coatings/adhesives/inks (e.g. mixing area). Extracted air may be treated by an off-gas treatment system. Only applicable where paints/coatings/ adhesives/inks are prepared.<br><br>**(d) Extraction of air from the drying/curing processes**<br>The curing ovens/dryers are equipped with an air extraction system. Extracted air may be treated by an off-gas treatment system. Only applicable to drying/curing processes.<br><br>**(e) Minimisation of fugitive emissions and heat losses from the ovens/dryers either by sealing the entrance and the exit of the curing ovens/dryers or by applying sub-atmospheric pressure in drying**<br>The entrance to and the exit from curing ovens/ dryers are sealed to minimise fugitive VOC emissions and heat losses. The sealing may be ensured by air jets or air knives, doors, plastic or metallic curtains, doctor blades, etc. Alternatively, ovens/dryers are kept under sub-atmospheric pressure. Only applicable when curing ovens/dryers are used.<br>**(f) Extraction of air from the cooling zone**<br>When substrate cooling takes place after drying/ curing, the air from the cooling zone is extracted and may be treated by an off-gas treatment system. Only applicable when substrate cooling takes place after drying/curing.<br><br>**(g) Extraction of air from storage of raw materials, solvents and solvent- containing wastes**<br>Air from raw material stores and/or individual containers for raw materials, solvents and solvent-containing wastes is extracted and may be treated by an off-gas treatment system. May not be applicable for closed containers or for storage of raw materials, solvents and solvent- containing wastes with a low vapour pressure and low toxicity.<br><br>**(h) Extraction of air from cleaning areas**<br>Air from the areas where machine parts and equipment are cleaned with organic solvents, either by hand or automatically, is extracted and may be treated by an off-gas treatment system. Only applicable to areas where machine parts and equipment are cleaned with organic solvents. | | |
| 15 | **Reducing VOC emissions in waste gases** and increase resource efficiency, by using one or a combination of the techniques given below. | **CC** | BAT AELS are provided in Table S3.1. |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| Technique | Description | Applicability |
|---|---|---|
| I. **Capture and recovery of solvents in off-gases** | | |
| (a) Condensation | A technique for removing organic compounds by reducing the temperature below their dew points so that the vapours liquefy. Depending on the operating temperature range required, different refrigerants are used, e.g. cooling water, chilled water (temperature typically around 5 °C), ammonia or propane. | Applicability may be restricted where the energy demand for recovery is excessive due to the low VOC content. |
| (b) Adsorption using activated carbon or zeolites | VOCs are adsorbed on the surface of activated carbon, zeolites or carbon fibre paper. Adsorbate is subsequently desorbed, e.g. with steam (often on site), for reuse or disposal and the adsorbent is reused. For continuous operation, typically more than two adsorbers are operated in parallel, one of them in desorption mode. Adsorption is also commonly applied as a concentration step to increase the subsequent oxidation efficiency. | Applicability may be restricted where the energy demand for recovery is excessive due to the low VOC content. |
| (c) Absorption using a suitable liquid | Use of a suitable liquid to remove pollutants from the off-gas by absorption, in particular soluble compounds and solids (dust). Solvent recovery is possible, for example, using distillation or thermal desorption. (For dust removal, see BAT 18.). | Generally applicable |
| II. **Thermal treatment of solvents in off-gases with energy recovery** | | |
| (d) Sending off-gases to a combustion plant | Part or all of the off-gases are sent as combustion air and supplementary fuel to a combustion plant (including CHP (combined heat and power) plants) used for steam and/or electricity production. Not applicable for off- gases containing substances referred to in IED Article 59(5). | Applicability may be restricted due to safety considerations. |
| (e) Recuperative thermal oxidation | Thermal oxidation using the heat of the waste gases, e.g. to preheat the incoming off-gases. | Generally applicable |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | (f) Regenerative thermal oxidation with multiple beds or with a valve less rotating air distributor | An oxidiser with multiple beds (three or five) filled with ceramic packing. The beds are heat exchangers, alternately heated by flue-waste gases from oxidation, then the flow is reversed to heat the inlet air to the oxidiser. The flow is reversed on a regular basis. In the valveless rotating air distributor, the ceramic medium is held in a single rotating vessel divided into multiple wedges. | Generally applicable | | |
| | g) Catalytic oxidation | Oxidation of VOCs assisted by a catalyst to reduce the oxidation temperature and reduce the fuel consumption. Exhaust heat can be recovered with recuperative or regenerative types of heat exchangers. Higher oxidation temperatures (500–750 °C) are used for the treatment of off-gas from the manufacturing of winding wire. | Applicability may be restricted by the presence of catalyst poisons. | | |
| | III. **Treatment of solvents in off-gases without solvent or energy** | | | | |
| | h) Biological off-gas treatment | Off-gas is dedusted and sent to a reactor with biofilter substrate. The biofilter consists of a bed of organic material (such as peat, heather, compost, root, tree bark, softwood and different combinations) or some inert material (such as clay, activated carbon, and polyurethane), where the off-gas stream is biologically oxidised by naturally occurring microorganisms into carbon dioxide, water, inorganic salts and biomass. The biofilter is sensitive to dust, high temperatures or high variations in the off-gas, e.g. of the inlet temperature or the VOC concentration. Supplementary nutrient feeding may be needed. | Only applicable to the treatment of biodegradable solvents. | | |
| | i) Thermal oxidation | Oxidation of VOCs by heating off-gases with air or oxygen to above their auto-ignition point in a combustion chamber and maintaining a high temperature long enough to complete the combustion of VOCs to carbon dioxide and water. | Generally Applicable | | |
| | BAT-associated emission levels (BAT-AELs) are given in Tables 11, 15, 17, 19, 21, 24, 27, 30, 32 and 35 of these BAT conclusions. | | | | |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>16</td><td>Reducing energy consumption of the VOC abatement system, BAT is to use one or a combination of the techniques given below.<br>(a) Maintaining the VOC concentration sent to the off-gas treatment system by using variable-frequency drive fans<br>(b) Internal concentration of solvents in the off- gases<br>(c) External concentration of solvents in the off- gases through adsorption<br>(d) Plenum technique to reduce waste gas volume</td><td>CC</td><td>The operator has confirmed that the thermal oxidiser employs variable-frequency drive fans to minimise energy consumption and comply with requirements of BAT 16. The RTO auto thermal state is used where possible.</td></tr>
<tr><td>17</td><td>To reduce NOX emissions in waste gases while limiting CO emissions from the thermal treatment of solvents in off-gases, BAT is to use technique (a) or both of the techniques given below.
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>(a) Optimisation of thermal treatment conditions (design and operation)</td><td>Good design of the combustion chambers, burners and associated equipment/devices is combined with optimisation of combustion conditions (e.g. by controlling combustion parameters such as temperature and residence time) with or without the use of automatic systems and the regular planned maintenance of the combustion system according to suppliers’ recommendations.</td><td>Design applicability may be restricted for existing plants.</td></tr>
<tr><td>(b) Use of low-NOX burners</td><td>The peak flame temperature in the combustion chamber is reduced, delaying but completing the combustion and increasing the heat transfer</td><td>Applicability may be restricted at existing plants by design and/or operational constraint</td></tr>
</table></td><td>CC</td><td>The operator uses technique A for BAT 17 for the optimisation of thermal treatment conditions to meet the emission levels given in the BAT AELS given in Table S3.1.</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | |
|---|---|---|
| | (increased emissivity of the flame). It is combined with increased residence time in order to achieve the desired VOC destruction. s. | |

*Table 1*

**BAT-associated emission level (BAT-AEL) for $NO_x$ emissions in waste gases and indicative emission level for CO emissions in waste gases from the thermal treatment of off-gases**

| Parameter | Unit | BAT-AEL (1) (Daily average or average over the sampling period) | Indicative emission level (1) (Daily average or average over the sampling period) |
|---|---|---|---|
| $NO_x$ | mg/Nm³ | 20–130 (2) | No indicative level |
| CO | | No BAT-AEL | 20–150 |

(1) The BAT-AEL and indicative level do not apply where off-gases are sent to a combustion plant.
(2) The BAT-AEL may not apply if nitrogen-containing compounds (e.g. DMF or NMP (*N*-methylpyrrolidone)) are present in the off-gas.

The associated monitoring is given in BAT 11

| | | | |
|---|---|---|---|
| 18 | In order to reduce dust emissions in waste gases from substrate surface preparation, cutting, coating application and finishing processes for the sectors and processes listed in Table 2, BAT is to use one or a combination of the techniques given below.<br>(a) Wet separation spray booth (flushed impact panel)<br>(b) Wet scrubbing<br>(c) Dry overspray separation with pre-coated material<br>(d) Dry overspray separation using filters<br>(e) Electrostatic precipitator | **NA** | There is no spray application of materials at the site. |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><th colspan="4">Table 2: BAT-associated emission levels (BAT-AELs) for dust emissions in waste gases</th></tr>
<tr><th>Parameter</th><th>Sector</th><th>Process</th><th>BAT-AEL (Daily average</th></tr>
<tr><td rowspan="5">Dust</td><td>Coating of vehicles</td><td>Spray coating</td><td rowspan="5"><1–3 mg/Nm$^3$</td></tr>
<tr><td>Coating of other metal & plastic surfaces</td><td>Spray coating</td></tr>
<tr><td>Coating of aircraft</td><td>Prep (e.g. sanding, blasting), coating</td></tr>
<tr><td>Coating and printing of metal packaging</td><td>Spray application</td></tr>
<tr><td>Coating of wooden surfaces</td><td>Preparation, coating</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>19</td><td>In order to use energy efficiently, BAT is to use techniques (a) and (b) and an appropriate combination of the techniques (c) to (h) given below.<br>(a) Energy efficiency plan<br>Descriptor An energy efficiency plan is part of the EMS (see BAT 1) and entails defining and calculating the specific energy consumption of the activity, setting key performance indicators on an annual basis (e.g. MWh/tonne of product) and planning the periodic improvement targets and related actions. The plan is adapted to the specificities of the plant in terms of process(es) carried out, materials, products, etc.<br>(b) Energy balance record<br>The drawing up once every year of an energy balance record which provides a breakdown of the energy consumption and generation (including energy export) by the type of source (e.g. electricity, fossil fuels, renewable energy, imported heat and/or cooling).<br><br>This includes:<br>(i)defining the energy boundary of the STS activity;<br>(ii) information on energy consumption in terms of delivered energy;<br>(iii) information on energy exported from the plant;<br>(iv)energy flow information (e.g. Sankey diagrams or energy balances) showing how the energy is used throughout the process.<br>The energy balance record is adapted to the specificities of the plant in terms of process(es) carried out, materials, etc.</td><td>CC</td><td>The plant has an energy efficiency plan as part of its Climate Change Agreement. Weekly gas and electricity usage is recorded alongside production<br>All heated tanks are insulated.<br>Kraft impregnation employs recuperative thermal oxidiser. Condition 1.2 requires the operator to implement energy efficiency measures.</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | Applicability: The level of detail and nature of the energy efficiency plan and of the energy balance record will generally be related to the nature, scale and complexity of the installation and the types of energy sources used. It may not be applicable if the STS activity is carried out within a larger installation, provided that the energy efficiency plan and the energy balance record of the larger installation sufficiently cover the STS activity.<br><br>**Process related Techniques**<br>(c) **Thermal insulation of tanks and vats containing cooled or heated liquids, and of combustion and steam systems** This may be achieved for example by:<br>– using double-skinned tanks;<br>– using pre-insulated tanks;<br>– applying insulation to combustion equipment, steam pipes and pipes containing cooled or heated liquids. Generally applicable<br>(d) **Heat recovery by cogeneration – CHP (combined heat and power) or CCHP (combined cooling, heat and power) Description:** Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities. CCHP (also called tri-generation) is a cogeneration system with an absorption chiller that uses low-grade heat to produce chilled water.<br>(e) **Heat recovery from hot gas streams** - Energy recovery from hot gas streams (e.g. from dryers or cooling zones), e.g. by their recirculation as process air, through the use of heat exchangers, in processes, or externally.<br>Applicability of (d) & (e) may be restricted by the plant layout, the characteristics of the hot gas streams (e.g. flow rate, temperature) or the lack of a suitable heat demand.<br>(f) **Flow adjustment of process air and off-gases** - Adjustment of the flow of process air and off-gases according to the need. This includes reduction of air ventilation during idle operation or maintenance. Generally applicable.<br>(g) **Spray booth off-gas recirculation** -Capture and recirculation of the off-gas from the spray booth in combination with efficient paint overspray separation. Energy consumption is less than in the case of fresh air use. Applicability may be restricted by health and safety considerations.<br>(h) **Optimised circulation of warm air in a large- volume curing booth using an air turbulator** - Air is blown into a single part of the curing booth and distributed using an air turbulator which turns the laminar airflow into the desired turbulent flow. Only applicable to spray coating sectors | | |
| | **Table 3 BAT-associated environmental performance levels (BAT-AEPLs) for specific energy consumption** | **NA** | The existing permit requires the annual reporting of these parameters |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>Sector</td><td>Product Type</td><td>BAT-AEPL (Yearly average)</td></tr>
<tr><td>Coating of Vehicles</td><td>Passenger cars<br>Vans<br>Truck cabins<br>Trucks</td><td>0,5–1,3 MWh/vehicle coated<br>0,8–2 MWh/vehicle coated<br>1–2 MWh/vehicle coated<br>0,3–0,5 MWh/vehicle coated</td></tr>
<tr><td>Coil coating</td><td>Steel and/or aluminium coil</td><td>0,2–2,5 kWh/m2 of coated coil (1)</td></tr>
<tr><td>Coating of textiles, foils and paper</td><td>Coating of textiles with polyurethane and/or polyvinyl chloride</td><td>1–5 kWh/m2 of coated surface</td></tr>
<tr><td>Manufacturing of winding wires</td><td>Wires with an average diameter > 0,1 mm Coating and printing of metal packaging All product types kWh/m2 of coated surface 0,3–1,5</td><td>< 5 kWh/kg of coated wire</td></tr>
<tr><td>Heatset web offset printing</td><td>All product types</td><td>4–14 Wh/m2 of printed area</td></tr>
<tr><td>Flexography and non-publication rotogravure printing</td><td>All product types</td><td>50–350 Wh/m2 of printed area</td></tr>
<tr><td>Publication rotogravure printing</td><td>All product types</td><td>10–30 Wh/m2 of printed area</td></tr>
<tr><td colspan="3">(1)The BAT-AEPL may not apply where the coil coating line is part of a larger manufacturing installation (e.g. steelworks) or for combines<br><br>The associated monitoring is given in BAT 19 (b).</td></tr>
</table>
</td><td></td><td>We are satisfied that the Installation is currently compliant with BATc 19.</td></tr>
<tr><td>20</td><td>BAT 20. In order to reduce water consumption and waste water generation from aqueous processes (e.g. degreasing, cleaning, surface treatment, wet scrubbing), BAT is to use technique (a) and an appropriate combination of the other techniques given below.<br>(a) Water management plan and water audits<br>A water management plan and water audits are part of the EMS (see BAT 1) and include:<br>• flow diagrams and a water mass balance of the plant;</td><td>NA</td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<ul>
<li>establishment of water efficiency objectives;</li>
<li>implementation of water optimisation techniques (e.g. control of water usage, water recycling, detection and repair of leaks). Water audits are carried out at least once every year.</li>
</ul>
Applicability - The level of detail and nature of the water management plan and water audits will generally be related to the nature, scale and complexity of the plant. It may not be applicable if the STS activity is carried out within a larger installation, provided that the water management plan and the water audits of the larger installation sufficiently cover the STS activity.<br><br>
(b) Reverse cascade rinsing Multiple stage rinsing in which the water flows in the opposite direction to the work-pieces/substrate. It allows a high degree of rinsing with a low water consumption. - Applicable where rinsing processes are used.<br><br>
(c) Reuse and/or recycling of water<br>
Water streams (e.g. spent rinse water, wet scrubber effluent) are reused and/or recycled, if necessary after treatment, using techniques such as ion exchange or filtration (see BAT 21). The degree of water reuse and/or recycling is limited by the water balance of the plant, the content of impurities and/or the characteristics of the water streams. Generally applicable.
</td><td></td><td></td></tr>
<tr><td>20</td><td>
Table 4 BAT-associated environmental performance levels (BAT-AEPLs) for specific water consumption
<table>
<tr><th>Sector</th><th>Product Type</th><th>BAT-AEPL (Yearly average)</th></tr>
<tr><td>Coating of Vehicles</td><td>Passenger cars<br>Vans<br>Truck cabins<br>Trucks</td><td>0,5–1,3 m3/vehicle coated<br>1-2.5 m3/vehicle coated<br>0.7-3 m3/vehicle coated<br>0,3–0,5 MWh/vehicle coated</td></tr>
<tr><td>Coil coating</td><td>Coil coating Steel and/or aluminium coils</td><td>0,2–1.3 l/m2 of coated coil (1)</td></tr>
<tr><td>Coating of textiles, foils and paper</td><td>Coil coating Steel and/or aluminium coils</td><td>90-110 l/1000 cans</td></tr>
<tr><td>Coating and printing of metal packaging</td><td>Two-piece DWI beverage cans</td><td>< 5 kWh/kg of coated wire</td></tr>
</table>
</td><td>NA</td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>(1)The BAT-AEPL may not apply where the coil coating line is part of a larger manufacturing installation (e.g. steelworks) or for combilines<br><br>The associated monitoring is given in BAT 20(a).</td><td></td><td></td></tr>
<tr><td>21</td><td>BAT 21. In order to reduce emissions to water and/or to facilitate water reuse and recycling from aqueous processes (e.g. degreasing, cleaning, surface treatment, wet scrubbing), BAT is to use a combination of the techniques given below.<br><br>
<table>
<tr><th>Technique</th><th>Description</th><th>Typical pollutants targeted</th></tr>
<tr><td colspan="3">Preliminary, primary and general treatment</td></tr>
<tr><td>(a) Equalisation.</td><td>Balancing of flows and pollutant loads by using tanks or other management techniques</td><td>All pollutants.</td></tr>
<tr><td>(b) Neutralisation</td><td>The adjustment of the pH of waste water to a neutral value (approximately 7)</td><td>Acids, alkalis</td></tr>
<tr><td colspan="2">(c) Physical separation, for example, by using screens, sieves, grit separators, primary settlement tanks and magnetic separation</td><td>Gross solids, suspended solids, metal particles.</td></tr>
<tr><td colspan="3">Physico-chemical treatment</td></tr>
<tr><td>(d) Adsorption</td><td>The removal of soluble substances (solutes) from the waste water by transferring them to the surface of solid, highly porous particles (typically activated carbon).</td><td>Adsorbable dissolved non-biodegradable or inhibitory pollutants, e.g. AOX.</td></tr>
<tr><td>(e) Vacuum distillation</td><td>The removal of pollutants by thermal waste water treatment under reduced pressure.</td><td>Dissolved non-biodegradable or inhibitory pollutants that can be distilled, e.g. some solvents.</td></tr>
<tr><td>(f) Precipitation</td><td>The conversion of dissolved pollutants into insoluble compounds by adding precipitants. The solid precipitates formed</td><td>Precipitable dissolved non-biodegradable or inhibitory pollutants, e.g. metals.</td></tr>
</table></td><td>NA</td><td>Minimal water use is utilised within the process and none of these techniques apply to this site.</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | | are subsequently separated by sedimentation, flotation or filtration. | | | |
| | (g) Chemical reduction | Chemical reduction is the conversion of pollutants by chemical reducing agents into similar but less harmful or hazardous compounds. | Reducible dissolved non-biodegradable or inhibitory pollutants, e.g. hexavalent chromium (Cr(VI)). | | |
| | (h) Ion exchange | The retention of ionic pollutants from waste water and their replacement by more acceptable ions using an ion exchange resin. | The pollutants are temporarily retained and afterwards released into a regeneration or backwashing liquid. Ionic dissolved non-biodegradable or inhibitory pollutants, e.g. metals. | | |
| | (i) Stripping | The removal of purgeable pollutants from the aqueous phase by a gaseous phase (e.g. steam, nitrogen or air) that is passed through the liquid. The removal efficiency may be enhanced by increasing the temperature or reducing the pressure. | Purgeable pollutants, e.g. some adsorbable organically bound halogens (AOX). | | |
| | **Biological treatment** | | | | |
| | (j) Biological treatment | Use of microorganisms for waste water treatment (e.g. anaerobic treatment, aerobic treatment). | Biodegradable organic compounds | | |
| | **Final solids removal** | | | | |
| | (k) Coagulation and flocculation | Coagulation and flocculation are used to separate suspended solids from waste water and are often carried out in successive steps. Coagulation is carried out by adding coagulants with charges opposite to those of the suspended solids. Flocculation is a gentle mixing stage so that collisions of microfloc particles cause them to bond to produce larger flocs. It may be assisted by adding polymers. | Suspended solids and particulate-bound metals | | |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | |
|---|---|---|
| (l) Sedimentation | The separation of suspended particles by gravitational settling. | |
| (m) Filtration | The separation of solids from waste water by passing them through a porous medium, e.g. sand filtration, nano-, micro- and ultrafiltration | |
| (n) Flotation | The separation of solid or liquid particles from waste water by attaching them to fine gas bubbles, usually air. The buoyant particles accumulate at the water surface and are collected with skimmers. | |
| | | |

**Table 5 BAT-associated emission levels (BAT-AELs) for DIRECT discharges to a receiving water body**

| Substance/Parameter | Sector | BAT-AEL (1) |
|---|---|---|
| Total suspended solids (TSS) | Coating of vehicles | 5–30 mg/l |
| Chemical oxygen demand (COD) (2) | Coil coating | 30–150 mg/l |
| Adsorbable organically bound halogens (AOX) | Coating and printing of metal packaging (only for DWI cans) | 0,1–0,4 mg/l |
| Fluoride (F-) | | 2–25 mg/l |
| Nickel (expressed as Ni) | Coating of vehicles<br>Coil coating | 0,05–0,4 mg/l |
| Zinc (expressed as Zn) | Coating of vehicles<br>Coil coating | 0,05–0,6 mg/l (4) |
| Total chromium (expressed as Cr) (5) | Coating of aircraft<br>Coil coating | 0,01–0,15 mg/l |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | |
|---|---|---|
| Hexavalent chromium (expressed as Cr(VI)) (6) | Coating of aircraft<br>Coil coating | 0,01–0,05 mg/l |

(1) The averaging period is given in the general considerations.
(2) The BAT-AEL for COD may be replaced by a BAT-AEL for TOC. The correlation between COD and TOC is determined on a case-by-case basis. The BAT-AEL for TOC is the preferred option because TOC monitoring does not rely on the use of very toxic compounds.
(3) The BAT-AEL only applies if fluorine compounds are used in the processes.
(4) The upper end of the BAT-AEL range may be 1 mg/l in the case of zinc-containing substrates or of substrates pretreated using zinc.
(5) The BAT-AEL only applies if chromium compounds are used in the processes.
(6) The BAT-AEL only applies if chromium(VI) compounds are used in the processes.

The associated monitoring is given in BAT 12.

**Table 6 BAT-associated emission levels (BAT-AELs) for INDIRECT discharges to a receiving water body**

| Substance/Parameter | Sector | BAT-AEL (1) |
|---|---|---|
| Adsorbable organically bound halogens (AOX) | Coating of vehicles<br>Coil coating | 0,1–0,4 mg/l |
| Fluoride (F-) | Coating and printing of metal packaging (only for DWI cans) | 2–25 mg/l |
| Nickel (expressed as Ni) | Coating of vehicles<br>Coil coating | 0,05–0,4 mg/l |
| Zinc (expressed as Zn) | Coating of vehicles<br>Coil coating | 0,05–0,6 mg/l (4) |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | <table><tr><td>Total chromium (expressed as Cr) (5)</td><td>Coating of aircraft<br>Coil coating</td><td>0,01–0,15 mg/l</td></tr><tr><td>Hexavalent chromium (expressed as Cr(VI)) (6)</td><td>Coating of aircraft<br>Coil coating</td><td>0,01–0,05 mg/l</td></tr><tr><td colspan="3">(1) The BAT-AELs may not apply if the downstream waste water treatment plant is designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment.<br>(2) The averaging period is given in the general considerations.<br>(3) The BAT-AEL only applies if fluorine compounds are used in the processes.<br>(4) The upper end of the BAT-AEL range may be 1 mg/l in the case of zinc-containing substrates or of substrates pretreated using zinc.<br>(5) The BAT-AEL only applies if chromium compounds are used in the processes.<br>(6) The BAT-AEL only applies if chromium(VI) compounds are used in the processes.<br>The associated monitoring is given in BAT 12.</td></tr></table> | | |
| 22 | BAT 22. In order to reduce the quantity of waste sent for disposal, BAT is to use the techniques (a) and (b) and one or both of the techniques (c) and (d) given below. | **CC** | A waste management plan is maintained in the environmental management system. Waste quantities are monitored monthly in the environmental data reporting platform.<br>The operator has stated that they are aiming to achieve zero waste to landfill, by reviewing alternative waste streams by reputable suppliers. All wastes are recycled where possible or used to produce waste to energy. |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><th colspan="2">Technique</th><th>Description</th></tr>
<tr><td>(a)</td><td>Waste management plan</td><td>A waste management plan is part of the EMS (see BAT 1) and is a set of measures aiming to: 1) minimise the generation of waste, 2) optimise the reuse, regeneration and/or recycling of waste and/or the recovery of energy from waste, and 3) ensure the proper disposal of waste.</td></tr>
<tr><td>(b)</td><td>Monitoring of waste quantities</td><td>Annual recording of waste quantities generated for each type of waste. The solvent content in the waste is determined periodically (at least once every year) by analysis or calculation.</td></tr>
<tr><td>(c)</td><td>Recovery/recycling of sol- vents</td><td>Techniques may include:<br>— recovering/recycling solvents from liquid waste by filtration or distillation on site or off site;<br>— recovering/recycling the solvent content of wipes by gravitational draining, wringing or centrifugation.</td></tr>
<tr><td>(d)</td><td>Waste-stream-specific techniques</td><td>Techniques may include:<br>— reducing the water content of the waste, e.g. by using a filter press for the sludge treatment;<br>— reducing the sludge and waste solvent generated, e.g. by reducing the number of cleaning cycles (see BAT 9);<br>— using reusable containers, reusing the containers for other purposes, or recycling the container material;<br>— sending the spent limestone generated from dry scrubbing to a lime or cement kiln.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>23</td><td>In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:</td><td>CC</td><td>Odour has historically been an issue at the site, but following the installation of the RTO odour</td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|
| | • a protocol containing actions and timelines;<br>• a protocol for response to identified odour incidents, e.g. complaints;<br>• an odour prevention and reduction programme designed to identify the source(s), to characterise the contributions of the source(s), and to implement prevention and/or reduction measures.<br>Applicability<br>The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated. | | nuisance was abated. An odour management plan is required through condition 3.4 of the permit to ensure that fugitive odours from the site are monitored and where necessary corrective action taken should this be deemed necessary.<br>The operator uses techniques to meet BAT for controlling fugitive emissions from the process including use of closed containers, minimal handling of solvent cleaning materials and ensuring doors are kept closed as far as possible.<br>The environmental management system includes a protocol for response to complaints including odour complaints. |
| **1.2 BAT conclusions for the coating of vehicles** | | | |
| BAT 24 | In order to reduce the consumption of solvents, other raw materials and energy, as well as to reduce VOC emissions, BAT is to use one or a combination of the coating systems given below. | **NA** | |
| | **Technique** / **Description** / **Applicability** | | . |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><td>(a)</td><td>Mixed (SB-mix) coating</td><td>A coating system where one coating layer (primer or base coat) is water-based.</td><td>Only applicable to new plants or major plant upgrades.</td></tr>
<tr><td>(b)</td><td>Water-based (WB) coating</td><td>A coating system where the primer and base coat layers are water-based.</td><td>Only applicable to new plants or major plant upgrades.</td></tr>
<tr><td>(c)</td><td>Integrated coating process</td><td>A coating system which combines the functions of primer and base coat and is applied by spray coating in two steps.</td><td>Only applicable to new plants or major plant upgrades.</td></tr>
<tr><td>(d)</td><td>Three-wet process</td><td>Coating system where the primer, base coat and clear coat layers are applied without intermediate drying. The primer and base coat may be solvent based or water-based.</td><td>Only applicable to new plants or major plant upgrades.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>24</td><td>
<table>
<tr><th colspan="5">Table 7 BAT-associated emission levels (BAT-AELs) for total emissions of VOCs from the coating of vehicles</th></tr>
<tr><td rowspan="2">Parameter</td><td rowspan="2">Vehicle type</td><td rowspan="2">Unit (Yearly average)</td><td colspan="2">BAT-AEL (1)</td></tr>
<tr><td>New plant</td><td>Existing Plant</td></tr>
<tr><td rowspan="5">Total VOC emissions as calculated by the solvent mass balance</td><td>Passenger cars</td><td>g VOCs per m2 of surface area (2)</td><td>8–15</td><td>8–30</td></tr>
<tr><td>Vans</td><td></td><td>10–20</td><td>10–40</td></tr>
<tr><td>Truck cabins</td><td></td><td>8–20</td><td>8–40</td></tr>
<tr><td>Trucks</td><td></td><td>10–40</td><td>10–50</td></tr>
<tr><td>Buses</td><td></td><td><100</td><td>90-150</td></tr>
</table>
</td><td>NA</td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
(1) The BAT-AELs refer to emissions from all process stages, carried out at the same installation from the electrophoretic coating or any other kind of coating process up to and including the final wax and polish of the topcoat, as well as solvents used in cleaning of production equipment, both during and outside the production period.<br>(2) The surface area is defined as set out in Part 3 of Annex VII to Directive 2010/75/EU<br><br>The associated monitoring is given in BAT 10.<br><br>
1.2.2. Waste quantity sent off site<br><br>
<table>
<tr><th colspan="5">Table 8 Indicative levels for specific waste quantity sent off site from the coating of vehicles</th></tr>
<tr><td>Parameter</td><td>Vehicle type</td><td>Relevant waste streams</td><td>Unit</td><td>Indicative level (Yearly average)</td></tr>
<tr><td rowspan="3">Waste Quantities sent off site</td><td>Passenger cars</td><td rowspan="3">• Waste paint<br>• Waste plastisols, sealers and adhesives<br>• Used solvents<br>• Paint sludge<br>• Other paint-shop-related waste (e.g. absorbent and cleaning materials, filters, packaging materials, spent activated carbon)</td><td rowspan="3">Kg/vehicle coated</td><td>3–9 (1)</td></tr>
<tr><td>Vans</td><td>4-17 (1)</td></tr>
<tr><td>Truck cabins</td><td>2-11 (1)</td></tr>
<tr><td colspan="5">(1) The upper end of the range is higher if dry scrubbing with limestone is used.<br><br>The associated monitoring is given in BAT 22 (b).</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td colspan="4">1.3 BAT conclusions for the coating of other metal and plastic surfaces</td></tr>
<tr><td>1.3</td><td>BAT conclusions for the coating of other metal and plastic surfaces<br>The emission levels given below for coating of other metal and plastic surfaces are associated with the general BAT conclusions described in Section 1.1. The emission levels given below may not apply where metal and/or plastic automotive components are coated in a vehicle coating plant and these emissions are included in the calculation of the total VOC emissions for the coating of vehicles (see Section 1.2).<br><br>
<table>
<tr><td colspan="4">Table 9 BAT-associated emission levels (BAT-AELs) for total emissions of VOCs from the coating of other metal and plastic surfaces</td></tr>
<tr><td>Parameter</td><td>Process</td><td>Unit</td><td>BAT-AEL (Yearly average)</td></tr>
<tr><td rowspan="2">Total VOC emissions as calculated by the solvent mass balance</td><td>Coating of metal surfaces</td><td rowspan="2">kg VOCs per kg of solid mass input</td><td>< 0,05–0,2</td></tr>
<tr><td>Coating of plastic surfaces</td><td>< 0,05–0,3</td></tr>
<tr><td colspan="4">The associated monitoring is given in BAT 10.</td></tr>
</table>
<br>As an alternative to the BAT-AELs in Table 9, the BAT-AELs in BOTH Table 10 and Table 11 may be used.</td><td>NA</td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 10 - BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from the coating of other metal and plastic surfaces</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | |
|---|---|---|
| Fugitive VOC emissions as calculated by the solvent mass balance | Percentage (%) of the solvent input | < 1–10 |

| ***Table 11*** **BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from the coating of other metal and plastic surfaces** | | |
|---|---|---|
| Parameter | Unit | BAT-AEL(Daily average or average over the sampling period) |
| TVOC | mg C/Nm3 | 1–20 (1) (2 |
| (1) The upper end of the BAT-AEL range is 35 mg C/Nm3 if techniques are used which allow the reuse/recycling of the recovered solvent.<br>(2) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator. | | |
| The associated monitoring is given in BAT 10. | | |

## 1.4 BAT conclusions for the coating of ships and yachts

**NA**

The BAT conclusion in this section applies to the coating of ships and yachts, and applies in addition to the general BAT conclusions given in Section 1.1.

In order to reduce total emissions of VOCs and dust emissions to air, to reduce emissions to water and to improve the overall environmental performance, BAT is to use techniques (a) and (b) and a combination of techniques (c) to (i) given below.

| Technique | Description | Applicability |
|---|---|---|

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | (a) Segregation of waste and waste water streams | Docks and slipways are constructed with:<br>• a system to collect and handle dry waste effectively and keep it separate from wet waste;<br>• a system to separate waste water from storm water and run-off water. | Only applicable to new plants or major plant upgrades. | | |
| | (b) Restrictions for adverse weather conditions | Where the treatment areas are not fully enclosed, blasting and/or airless spray coating are not carried out if adverse weather conditions are observed or forecast. | Generally applicable. | | |
| | (c) Partial enclosure of treatment areas | Fine nets and/or water spray curtains are used around areas where blasting and/or airless spray coating are carried out to prevent dust emissions. They may be permanent or temporary. | Applicability may be restricted by the shape and size of the area to be enclosed. Water spray curtains may not be applicable in cold climatic conditions. | | |
| | (d) Full enclosure of treatment areas | Blasting and/or airless spray coating are carried out in halls, closed workshops, areas tented with textiles or areas fully enclosed with nets to prevent dust emissions. Air from the treatment areas is extracted and may be sent to off-gas treatment; see also BAT 14 (b). | Applicability may be restricted by the shape and size of the area to be enclosed. | | |
| | (e) Dry blasting in a closed system. | Dry blasting using steel grit or shot is carried out in closed blasting systems equipped | Generally applicable. | | |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | | with a suction head and centrifugal blasting wheels | |
| (f) | Wet blasting | Blasting is carried out with water containing a fine abrasive material, such as a fine cinder (e.g. copper slag cinder) or silica. | May not be applicable in cold climatic conditions and/or in enclosed areas (cargo tanks, double bottom tanks) due to the heavy mist formation. |
| (g) | (Ultra-)High-Pressure ((U)HP) water jetting or blasting | (U)HP blasting is a dustless surface treatment method using extremely high-pressure water. There are options with or without an abrasive. | May not be applicable in cold climatic conditions, or due to surface specifications (e.g. new surfaces, spot blasting). |
| (h) | Stripping of coatings by induction heating | An inductor head is moved over the surface, causing localised fast heating of the steel to lift old coatings. | May not be applicable for surfaces with a thickness of less than 5 mm and/or for surfaces with components sensitive to induction heating (e.g. insulation, flammable) |
| (i) | Underwater hull and propeller cleaning system | Underwater cleaning system using water pressure and rotating polypropylene brushes. | Not applicable for ships in full dry dock. |

**Table 12 BAT-associated emission level (BAT-AEL) for total emissions of VOCs from the coating of ships and yachts**

| Parameter | Unit | BAT-AEL(Yearly average) |
|---|---|---|
| Total VOC emissions as calculated by the solvent mass balance | kg VOCs per kg of solid mass input | < 0,375 |
| **The associated monitoring is given in BAT 10** | | |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td colspan="4">1.5 BAT conclusions for the coating of aircraft</td></tr>
<tr><td></td><td>The BAT conclusion in this section applies to the coating of aircraft, and applies in addition to the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td>26</td><td>
<table>
<tr><td>Technique</td><td>Description</td><td>Applicability</td></tr>
<tr><td>Enclosure</td><td>Component parts are coated in enclosed spray booths (see BAT 14 (b)).</td><td>Generally applicable.</td></tr>
<tr><td>Direct printing</td><td>Use of a printing device to directly print complex layouts on the aircraft parts.</td><td>Applicability may be restricted by technical considerations (e.g. accessibility of the applicator gantry, customised colours).</td></tr>
</table>
</td><td>NA</td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 13 BAT-associated emission level (BAT-AEL) for total emissions of VOCs from the coating of aircraft</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
<tr><td>Total VOC emissions as calculated by the solvent mass balance</td><td>kg VOCs per kg of solid mass input</td><td>0,2–0,58</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 10</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td colspan="4">1.6 BAT conclusions for coil coating</td></tr>
<tr><td>1.6</td><td>The emission levels for coil coating given below are associated with the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 14 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from coil coating</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
<tr><td>Fugitive VOC emissions as calculated by the solvent mass balance</td><td>Percentage (%) of the solvent input</td><td>< 1–3</td></tr>
</table>
</td><td>NA</td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>The associated monitoring is given in BAT 10</td><td></td><td></td></tr>
<tr><td></td><td>
Table 15 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from coil coating
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL(Daily average or average over the sampling period)</th></tr>
<tr><td>TVOC</td><td>mg C/Nm3</td><td>1–20 (1) (2</td></tr>
<tr><td colspan="3">(1) The upper end of the BAT-AEL range is 50 mg C/Nm3 if techniques are used which allow the reuse/recycling of the recovered solvent.<br>(2) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator.</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 10.</td></tr>
</table>
</td><td>NA</td><td></td></tr>
<tr><td colspan="4">1.7. BAT conclusions for the manufacturing of adhesive tapes</td></tr>
<tr><td>1.7</td><td>
The emission levels for the manufacturing of adhesive tapes given below are associated with the general BAT conclusions given in Section 1.1.
Table 16 BAT-associated emission level (BAT-AEL) for total emissions of VOCs from the manufacturing of adhesive tapes
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL(Yearly average)</th></tr>
<tr><td>Total VOC emissions as calculated by the solvent mass balance</td><td>Percentage (%) of the solvent input</td><td>< 1–3 (1)</td></tr>
<tr><td colspan="3">(1) This BAT-AEL may not apply to the manufacturing of plastic films used in temporary surface protection.<br>The associated monitoring is given in BAT 10</td></tr>
</table>
</td><td>NA</td><td></td></tr>
</table>


Page 50 of 62

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 17 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from the manufacturing of adhesive tapes</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Daily average or average over the sampling period)</td></tr>
<tr><td>TVOC</td><td>mg C/Nm3</td><td>1–20 (1) (2</td></tr>
<tr><td colspan="3">(1) The upper end of the BAT-AEL range is 50 mg C/Nm3 if techniques are used which allow the reuse/recycling of the recovered solvent. (2) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator.</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 11.</td></tr>
</table>
</td><td>NA</td><td></td></tr>
<tr><td colspan="4">1.8 BAT conclusions for the coating of textiles, foils and paper</td></tr>
<tr><td></td><td>The emission levels for the coating of textiles, foils and paper given below are associated with the general BAT conclusions given in Section 1.1.</td><td></td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 18 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from the coating of textiles, foils and paper</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
<tr><td>Fugitive VOC emissions as calculated by the solvent mass balance</td><td>Percentage (%) of the solvent input</td><td>< 1–5</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 10</td></tr>
</table>
</td><td>CC</td><td>Condition 4.2 of the permit requires that the operator reports compliance with the emission limits that includes for fugitive VOC emissions. These are to be calculated annually and reported to the Regulator for compliance with BAT.</td></tr>
<tr><td></td><td>
<table>
<tr><td>Table 19 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from the coating of textiles, foils and paper</td></tr>
</table>
</td><td>NA</td><td>Applying fugitive for TVOC emission limit.</td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL(Daily average or average over the sampling period)</th></tr>
<tr><td>TVOC</td><td>mg C/Nm3</td><td>5–20 (1) (2</td></tr>
<tr><td colspan="3">(1) The upper end of the BAT-AEL range is 50 mg C/Nm3 if techniques are used which allow the reuse/recycling of the recovered solvent.<br>(2) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator.</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 11.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td colspan="4">1.9 BAT conclusions for the manufacturing of winding wire</td></tr>
<tr><td></td><td>The BAT conclusion in this section applies to the manufacturing of winding wire, and applies in addition to the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td>27</td><td>BAT 27. In order to reduce total emissions of VOCs and energy consumption, BAT is to use technique (a) and one or a combination of the techniques (b) to (d) given below.
<table>
<tr><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>(a) Process-integrated VOC oxidation.</td><td>The air/solvent mix resulting from solvent evaporation during the repeated enamel curing process is treated in a catalytic oxidiser (see BAT 15 (g)) integrated in the curing oven/dryer. The waste heat from the catalytic oxidiser is used in the drying process to heat up the circulating airflow and/or as process heat for other purposes within the plant.</td><td>Generally applicable</td></tr>
<tr><td>(b) Solvent-free lubricants</td><td>Solvent-free lubricants are applied as follows: — the wire is drawn through a lubricant-wetted felt; or — a lubricant-impregnated filament is run with the wire and the paraffin wax melts due to the</td><td>Applicability may be limited due to product quality requirements or specifications, e.g. diameter.</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | |
|---|---|---|
| | residual heat of the wire and the frictional heat. | |
| (c) Self-lubricating coatings | A solvent-containing lubrication step is avoided by using a coating system that also contains lubricant (a special wax). | Applicability may be limited due to product quality requirements or specifications. |
| (d) High-solids enamel coating | Use of enamel coating with a solids content of up to 45 %. In the case of fine wires (with a diameter less than or equal to 0.1 mm), the solids content is up to 30 %. | |

**NA**

*Table 20*

**BAT-associated emission level (BAT-AEL) for total emissions of VOCs from the manufacture of winding wire**

| **Parameter** | Product type | **Unit** | **BAT-AEL(Yearly average)** |
|---|---|---|---|
| Total VOC emissions as calculated by the solvent mass balance | Coating of winding wire with an average diameter greater than 0,1 mm | g VOCs per kg of coated wire | 1–3,3 |
| **The associated monitoring is given in BAT 10** | | | |

**NA**

*Table 21*

**BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from the manufacture of winding wire**

| **Parameter** | **Unit** | **BAT-AEL(Daily average or average over the sampling period)** |
|---|---|---|
| **TVOC** | **mg C/Nm3** | **5–40** |

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>The associated monitoring is given in BAT 11.<br></td><td></td><td></td></tr>
<tr><td colspan="4">1.10 BAT conclusions for the coating and printing of metal packaging</td></tr>
<tr><td>1.10.</td><td>BAT conclusions for the coating and printing of metal packaging<br>The emission levels for the coating and printing of metal packaging given below are associated with the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td></td><td>Table 22 BAT-associated emission level (BAT-AEL) for total emissions of VOCs from the coating and printing of metal packaging
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL(Yearly average)</th></tr>
<tr><td>Total VOC emissions as calculated by the solvent mass balance</td><td>g VOCs per m2 of coated/printed surface</td><td>< 1–3.5</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 10</td></tr>
<tr><td colspan="3"></td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td>As an alternative to the BAT-AEL in Table 22, the BAT-AELs in both Table 23 and Table 24 may be used.<br><br>Table 23 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from the coating and printing of metal packaging
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL(Yearly average)</th></tr>
<tr><td>Fugitive VOC emissions as calculated by the solvent mass balance</td><td>Percentage (%) of the solvent input</td><td>< 1–12</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 10</td></tr>
</table></td><td>NA</td><td></td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

*Table 24 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from the coating and printing of metal packaging*

| Parameter | Unit | BAT-AEL(Daily average or average over the sampling period) |
|---|---|---|
| **TVOC** | **mg C/Nm3** | **1–20 (1)** |

(1) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator.

**The associated monitoring is given in BAT 11.**

## 1.11 BAT CONCLUSIONS FOR HEATSET WEB OFFSET PRINTING

The BAT conclusion in this section applies to heatset web offset printing, and applies in addition to the general BAT conclusions given in Section 1.1. **NA**

**NA**

| Technique | Description | Applicability |
|---|---|---|
| **Material-based and printing techniques** | | |
| (a) Use of low-IPA or IPA- free additives in dampening solutions | Reduction or avoidance of isopropanol (IPA) as a wetting agent in dampening solutions, through substitution by mixtures of other organic compounds which are not volatile or have a low volatility | Applicability may be limited by technical and product quality requirements or specifications |
| (b) Waterless offset. | Modification of the press and the pre-press processes to enable the use of specially coated offset plates, eliminating the need for dampening | May not be applicable for long print runs due to the need for more frequent changes of plates. |
| **Cleaning techniques** | | |

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | | | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|---|---|
| | (c) Use of VOC-free solvents or solvents with low volatility for automatic blanket cleaning | Use of organic compounds which are not volatile or have a low volatility as cleaning agents for automatic blanket cleaning. | Generally applicable | | |
| | **Off-gas treatment techniques** | | | | |
| | (d) Web offset dryer integrated with off-gas treatment | A web offset dryer with an integrated off-gas treatment unit, enabling incoming dryer air to be mixed with a part of the waste gases returned from the off-gas thermal treatment system. | Applicable to new plants or major plant upgrades | | |
| | (e) Extraction and treatment of air from the press room or the press encapsulation | Routing of extracted air from the press room or the press encapsulation to the dryer. As a result, a part of the solvents evaporated in the press room or press encapsulation is abated by the thermal treatment (see BAT 15) downstream of the dryer. | Generally applicable. | | |
| | | | | **NA** | |

*Table 25* **BAT-associated emission level (BAT-AEL) for total emissions of VOCs from heatset web offset printing**

| Parameter | Unit | BAT-AEL(Yearly average) |
|---|---|---|
| Total VOC emissions as calculated by the solvent mass balance | kg VOCs per kg of ink input | < 0,01–0,04 (1) |
| (1) The upper end of the BAT-AEL range is related to the production of high-quality products. | | |
| **The associated monitoring is given in BAT 10** | | |

As an alternative to the BAT-AELs in Table 25, the BAT-AELs in both Table 26 and Table 27 may be used.

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 26 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from heatset web offset printing</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
<tr><td>Fugitive VOC emissions as calculated by the solvent mass balance</td><td>% of the solvent input</td><td>< 1–10 (1)</td></tr>
<tr><td colspan="3">(1) The upper end of the BAT-AEL range is related to the production of high-quality products.<br>The associated monitoring is given in BAT 10</td></tr>
</table>
<table>
<tr><td colspan="3">Table 27 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from heatset web offset printing</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Daily average or average over the sampling period)</td></tr>
<tr><td>TVOC</td><td>mg C/Nm3</td><td>1–15</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 11.</td></tr>
</table>
</td><td>NA</td><td></td></tr>
<tr><td colspan="4">1.12 BAT conclusions for flexography and non-publication rotogravure printing</td></tr>
<tr><td>1.12</td><td>The emission levels for flexography and non-publication rotogravure printing given below are associated with the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="3">Table 28 BAT-associated emission level (BAT-AEL) for total emissions of VOCs from flexography and non- publication rotogravure printing</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
</table>
</td><td>NA</td><td></td></tr>
</table>

| BATC no | Summary of BAT Conclusion requirement for Surface Treatment using Solvents. | Status NA/ C/FC/NC | Assessment proposed by the operator to demonstrate compliance with the BATc |
|---|---|---|---|

| | | |
|---|---|---|
| Total VOC emissions as calculated by the solvent mass balance | kg VOCs per kg of solid mass input | < 0,1–0,3 |
| (1) The upper end of the BAT-AEL range is related to the production of high-quality products. | | |
| **The associated monitoring is given in BAT 10** | | |

As an alternative to the BAT-AEL in Table 28, the BAT-AELs in both Table 29 and Table 30 may be used.

**Table 29 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from flexography and non- publication rotogravure printing**

| Parameter | Unit | BAT-AEL(Yearly average) |
|---|---|---|
| Fugitive VOC emissions as calculated by the solvent mass balance | Percentage (%) of the solvent input | < 1–12 |
| **The associated monitoring is given in BAT 10** | | |

**Table 30 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from flexography and non- publication rotogravure printing**

| Parameter | Unit | BAT-AEL (Daily average or average over the sampling period) |
|---|---|---|
| **TVOC** | **mg C/Nm3** | 1–20 (1) (2) |
| (1) The upper end of the BAT-AEL range is 50 mg C/Nm3 if techniques are used which allow the reuse/recycling of the recovered solvent. (2) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator. **The associated monitoring is given in BAT 11.** | | |

## 1.13 BAT conclusions for publication rotogravure printing

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td>1.13</td><td>The BAT conclusion in this section applies to publication rotogravure printing, and applies in addition to the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td></td><td>BAT 29. In order to reduce VOC emissions from publication rotogravure printing, BAT is to use a toluene recovery system based on adsorption and one or both of the techniques given below.<br><br><table><tr><td>Technique</td><td>Description</td></tr><tr><td>(a) Use of retention inks</td><td>Retention inks slow the formation of the dried film surface, which allows toluene to evaporate over a longer time and therefore more toluene to be released in the dryer and recovered by the toluene recovery system</td></tr><tr><td>(b) Automatic cleaning systems connected to the toluene recovery system</td><td>Automated cylinder cleaning with air extraction to the toluene recovery system</td></tr></table></td><td>NA</td><td></td></tr>
<tr><td></td><td><table><tr><td colspan="3">Table 31 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from publication rotogravure printing</td></tr><tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr><tr><td>Fugitive VOC emissions as calculated by the solvent mass balance</td><td>Percentage (%) of the solvent input</td><td>< 2,5</td></tr><tr><td colspan="3">The associated monitoring is given in BAT 10</td></tr></table></td><td></td><td></td></tr>
<tr><td></td><td><table><tr><td colspan="3">Table 32 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from publication rotogravure printing</td></tr><tr><td>Parameter</td><td>Unit</td><td>BAT-AEL<br>(Daily average or average over the sampling period)</td></tr><tr><td>TVOC</td><td>mg C/Nm3</td><td>10–20</td></tr></table></td><td></td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>The associated monitoring is given in BAT 11.</td><td></td><td></td></tr>
<tr><td colspan="4">1.14. BAT conclusions for the coating of wooden surfaces</td></tr>
<tr><td></td><td>The emission levels for the coating of wooden surfaces given below are associated with the general BAT conclusions given in Section 1.1.</td><td>NA</td><td></td></tr>
<tr><td></td><td>
<table>
<tr><td colspan="4">Table 33 BAT-associated emission level (BAT-AEL) for total emissions of VOCs from the coating of wooden surfaces</td></tr>
<tr><td>Parameter Coated</td><td>substrates</td><td>Unit</td><td>BAT-AEL (Yearly average)</td></tr>
<tr><td rowspan="2">Total VOC emissions as calculated by the solvent mass balance</td><td>Flat substrates</td><td>kg VOCs per kg of solid mass input</td><td>< 0,1</td></tr>
<tr><td>Other than flat substrates</td><td></td><td><0.25</td></tr>
<tr><td colspan="4">The associated monitoring is given in BAT 10.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td></td><td>As an alternative to the BAT-AELs in Table 33, the BAT-AELs in both Table 34 and Table 35 may be used.
<table>
<tr><td colspan="3">Table 34 BAT-associated emission level (BAT-AEL) for fugitive emissions of VOCs from the coating of wooden surfaces</td></tr>
<tr><td>Parameter</td><td>Unit</td><td>BAT-AEL(Yearly average)</td></tr>
<tr><td>Fugitive VOC emissions as calculated by the solvent mass balance</td><td>Percentage (%) of the solvent input</td><td>< 10</td></tr>
<tr><td colspan="3">The associated monitoring is given in BAT 10</td></tr>
</table>
<table>
<tr><td>Table 35 BAT-associated emission level (BAT-AEL) for VOC emissions in waste gases from the coating of wooden surfaces</td></tr>
</table>
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>BATC no</th><th>Summary of BAT Conclusion requirement for Surface Treatment using Solvents.</th><th>Status NA/ C/FC/NC</th><th>Assessment proposed by the operator to demonstrate compliance with the BATc</th></tr>
<tr><td></td><td>
<table>
<tr><th>Parameter</th><th>Unit</th><th>BAT-AEL<br>(Daily average or average over the sampling period)</th></tr>
<tr><td>TVOC</td><td>mg C/Nm3</td><td>5-20 (1)</td></tr>
<tr><td colspan="3">(1) For plants using BAT 16 (c) in combination with an off-gas treatment technique, an additional BAT-AEL of less than 50 mg C/Nm3 applies to the waste gas of the concentrator.<br><br>The associated monitoring is given in BAT 11.</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

## Key Issues

Where relevant and appropriate, we have incorporated the techniques described by the Operator in their Regulation 61 Notice response as specific operating techniques required by the permit, through their inclusion in Table S1.2 of the Consolidated Variation Notice.

Condition 5.9 from the previous permit has been re-attached as condition 1.1.4 on the consolidated permit.
Condition5.7 from the previous permit has been re-attached as condition 4.4 on the consolidated permit to address training requirements.

## Annex 2: Review and assessment of changes that are not part of the BAT Conclusions derived permit review

Soil & groundwater risk assessment (baseline report)

The IED requires that the operator of any IED installation using, producing or releasing “relevant hazardous substances” (RHS) shall, having regarded the possibility that they might cause pollution of soil and groundwater, submit a “baseline report” with its permit application. The baseline report is an important reference document in the assessment of contamination that might arise during the operational lifetime of the regulated facility and at cessation of activities. It must enable a quantified comparison to be made between the baseline and the state of the site at surrender.

At the definitive cessation of activities, the operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into account both the baseline conditions and the site’s current or approved future use. To do this, the operator has to submit a surrender application to us, which we will not grant unless and until we are satisfied that these requirements have been met.

The operator submitted a site condition report reference D7617 during the original application received on 15th May 2018. The site condition report included a report on the baseline conditions as required by Article 22. We reviewed that report and considered that it adequately described the condition of the soil and groundwater at that time. Consequently, we are satisfied that the baseline conditions have not changed.