



# Best Available Techniques & Operating Techniques

## Pentre Agrochemicals Plant Permit Variation Application

### **FMC Agro Limited**

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## Table of Contents

<b>Basis of Report</b> .....	<b>i</b>
<b>Acronyms and Abbreviations</b> .....	<b>iv</b>
<b>1.0 Introduction</b> .....	<b>1</b>
1.1 The Site.....	1
1.2 The Site Boundary.....	1
<b>2.0 Management of Activities</b> .....	<b>1</b>
2.1 Management Systems.....	1
2.2 Management Techniques .....	1
2.2.1 Monitoring, Measuring and Reviewing Environmental Performance .....	2
2.2.2 Staffing, Competence and Training .....	2
2.3 Accident Management Plan.....	2
2.3.1 Hazard Identification.....	2
<b>3.0 Site Infrastructure</b> .....	<b>2</b>
3.1 Existing Plant proposed for replacement .....	2
3.2 Proposed replacement plant.....	3
3.2.1 Plant Design.....	3
3.2.2 Construction .....	3
<b>4.0 Process Description</b> .....	<b>4</b>
<b>5.0 BAT Assessment</b> .....	<b>4</b>
<b>6.0 Waste Handling, Recovery or Disposal</b> .....	<b>5</b>
<b>7.0 In-Process Controls</b> .....	<b>6</b>
7.1 Instrumentation .....	6
7.2 Tanker Off-loading.....	6
7.3 Normal Operation .....	6
7.4 Overfill Protection .....	7
7.5 Water Scrubber System .....	7
<b>8.0 Emissions</b> .....	<b>8</b>
8.1 Point Source Emissions to Air .....	8
8.2 Point Source Emissions to Water .....	8
<b>9.0 Monitoring</b> .....	<b>8</b>
<b>10.0 Closure</b> .....	<b>8</b>
<b>11.0 Environmental Impact</b> .....	<b>9</b>
11.1 Impact Assessments .....	9
11.2 Environmental Risk Assessment .....	9
11.3 Air Emissions Risk Assessment .....	9



## Tables in Text

Table 1 – Historical Operational Hours for the Abatement System .....	4
Table 2 - Relevant EU BAT Conclusions (BATc).....	5



## Acronyms and Abbreviations

EP	Environmental Permit
NRW	Natural Resources Wales
FMC	FMC Agro Limited
EMS	Environmental Management System
EHS	Environment, Health and Safety
AMP	Accident Management Plan
HMI	Human Machine Interface
IBC	Intermediate Bulk Container
ASOV	Automatic Shut Off Valve
BAT	Best Available Techniques
BRef	EU BAT Reference Document
BATc	EU BAT conclusions
CCW	Common Wastewater and Waste Gas Treatment / Management in the Chemical Sector
CMR	Carcinogenic, Mutagenic and Reprotoxic chemicals
HAZOP	Hazard and Operability Assessment
NOx	Oxides of Nitrogen
OTNOC	Other Than Normal Operating Conditions
PHA	Process Hazard Assessment
WGC	Common Waste Gas Management and Treatment Systems in the Chemical Sector



## 1.0 Introduction

SLR has been instructed by FMC Agro Limited (FMC) to prepare an application for a minor technical variation of the bespoke Environmental Permit (EP), reference EPR/FP3031CW/V004 for the Pentre Agrochemicals Plant facility (the site) located at Pentre, Flintshire, CH5 2DH, for submission to Natural Resources Wales (NRW).

The site currently holds an EP to operate the following Part A(1) activity as defined in Schedule 1, Part 2 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended):

- Section 4.2, Part A(1)(a)(iv) – producing inorganic chemicals such as – salts (for example ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate, cupric acetate, ammonium phosphomolybdate).

This EP variation application does not alter any of the existing activities carried out on site, but relates solely to the replacement of an existing nitric acid storage tank with a new bunded tank, and the replacement of an existing water scrubber with a new water scrubber unit for the abatement of potential nitric acid fume within air displaced from the bulk storage tank and nitrogen dioxide extracted from the Mixer 3 plant. No other changes are proposed at the site.

### 1.1 The Site

The Pentre Agrochemicals Plant installation is located on Rectors Lane, Pentre, Deeside. The site is approximately 600m from the centre of Sandycroft village to the south east. Light industrial units border the site to the west and south, while the Chester to Holyhead railway line runs along the north eastern boundary of the site. The River Dee is approximately 500m beyond the railway line

### 1.2 The Site Boundary

The site boundary remains the same as per the existing EP. The site boundary is shown on Drawing 001.

## 2.0 Management of Activities

### 2.1 Management Systems

FMC will continue to operate the site in accordance with the existing Environmental Management System (EMS). The EMS includes the policies, management principles, organisational structure, responsibilities, standards/procedures, process controls and resources required to manage environmental protection across all aspects of the business.

The EMS is subject to regular external audits and has been reviewed by NRW.

### 2.2 Management Techniques

Compliance with existing operating procedures will continue to provide effective control of site operations.

A maintenance programme for the new equipment will be implemented which will follow the inspection and maintenance schedule recommended by the equipment manufacturer(s). The



maintenance programme will be reviewed annually to ensure any necessary changes are implemented.

Any operation and maintenance manuals provided by the equipment manufacturer(s) will be held on site. Where necessary, all monitoring and process control equipment will be calibrated in accordance with manufacturers' recommendations.

### **2.2.1 Monitoring, Measuring and Reviewing Environmental Performance**

The EHS Manager will continue to review the facility's environmental performance on a regular basis to ensure policy commitments are met, that policy remains relevant, and to ensure that actions to improve environmental performance are identified. Records of environmental performance will be maintained within the existing filing system.

### **2.2.2 Staffing, Competence and Training**

Relevant site staff will benefit from training on the new equipment, which will ensure their professional and technical development continues. This will reduce the likelihood of accidents and minimise the impact of the installation on the environment, by ensuring the site operates correctly.

## **2.3 Accident Management Plan**

FMC recognises the importance of the prevention of accidents that may have environmental consequences and that it is crucial to limit those consequences should an incident occur.

The existing Accident Management Plan (AMP) will be updated and maintained at the site to ensure the site's staff are fully prepared for such incidents. The AMP will continue to be reviewed every three years as a minimum, and after any reportable incident on site. The document will be continually improved in these reviews to include best practice and minimise the risk of accidents occurring.

### **2.3.1 Hazard Identification**

The following hazards have been identified with the proposed changes on site:

- air emissions; and
- accidents.

The Air Emissions Risk Assessment in Section 04 of this application demonstrates how the air emissions will be mitigated. The existing AMP addresses credible accident scenarios on site.

## **3.0 Site Infrastructure**

### **3.1 Existing Plant proposed for replacement**

The current equipment associated with the bulk storage of 60% nitric acid on site comprises:

- double skinned plastic bulk storage tank of 26,050lt capacity;
- water scrubber abatement system which serves the bulk storage tank and production mixing vessel; and



- associated transfer pipework for tanker offloading and transfer to production mixing vessel.

Existing equipment will be decommissioned and removed from site for re-use, recovery or disposal.

### 3.2 Proposed replacement plant

The proposed replacement equipment to be installed for the bulk storage of 60% nitric acid on site comprises:

- a 304L stainless steel bulk storage tank and associated lute pot;
- CIRIA C736 compliant concrete secondary containment bund for the bulk storage tank;
- water scrubber abatement system for the bulk storage tank and production mixing vessel;
- associated transfer pipework for tanker offloading and transfer to production mixing vessel; and
- dedicated PLC and instrumentation.

The new bulk storage tank and associated infrastructure will be installed in an alternative location on the site to allow the construction and installation of the new equipment whilst the existing equipment is still in use to minimise production down time. The 2 nitric acid storage systems will not operate coincidentally with the existing system being decommissioned once the new equipment is brought into service.

The details of the location of the new nitric acid storage equipment and relocated Emission Point A006 are presented in Drawing 001.

#### 3.2.1 Plant Design

The design volumes are:

- Bulk storage tank = 24m<sup>3</sup>
- Lute pot = 0.45m<sup>3</sup>

Both the tank and lute pot have been designed for atmospheric operational pressures.

The containment bund has been designed to have a capacity in excess of 110% of the gross volume of the nitric acid tank.

#### 3.2.2 Construction

The materials of construction of both the tank and lute pot are 304L stainless steel. Both structures have been subject to Non-Destructive Testing and the tank has also been pressure tested to 70mbarg (1psig).

All relevant certification documentation has been provided for the materials of construction, test welds and welding consumables for both the tank and lute pot. Suitably qualified welders have fabricated both structures.

The containment bund has been constructed from reinforced concrete to EN1992-3:2006. Please refer to the risk assessment document, reference 410.065838.00001\_CIRIA 736



Risk Assessment included in Section 06 of this application, for details of how the bund design and construction are in accordance with the CIRIA C736 guidance.

## 4.0 Process Description

The production of products using nitric acid as a raw material is very much dependent on customer demand and forecast. None of the products are manufactured on a continuous basis. The water scrubber abatement system is only operational during the production time of these products and during bulk deliveries of nitric acid.

Production data and bulk delivery data from 2020 to 2023 demonstrates the frequency of operation of the water scrubber abatement system, see Table 1.

**Table 1 – Historical Operational Hours for the Abatement System**

Year	Product Name							Tanker Off-loading	Annual Total Hours
	Century	Emperor	Jett 200	Jett 235	Seamac Gold	Zinc Liquid	Zinc Nitrate		
2021	4	3	328	32	0.2	1.2	N/A	18	386.4
2022	8	1.5	244	28	2.2	1	N/A	18	302.7
2023	4	3	208	44	0.2	1.2	2	18	280.4
<b>Total hours</b>	<b>16</b>	<b>7.5</b>	<b>780</b>	<b>104</b>	<b>2.6</b>	<b>3.4</b>	<b>2</b>	<b>54</b>	<b>969.5</b>

From Table 1, it can be concluded that the water scrubber abatement system was operational for very limited hours per year as follows:

- 2021 = 4.4% of the year;
- 2022 = 3.6% of the year; and
- 2023 = 3.2% of the year.

There is not anticipated to be any significant change or increase in the frequency of operation of the water scrubber abatement system in the future.

The limited operational hours of the water scrubber abatement system and the implication this will have on potential offsite environmental risk is considered in the Air Emissions Risk Assessment included in Section 04 of this application.

## 5.0 BAT Assessment

An assessment of compliance with specific BAT requirements of the applicable EU BAT Reference Notes (BRef) / BAT Conclusions (BATc) has been undertaken as listed in Table 2.



**Table 2 - Relevant EU BAT Conclusions (BATc)**

EU BAT Conclusions (BATc)	Applicability to the Installation Activities	Comments	Location of Assessment
CWW Common Wastewater and Waste Gas Treatment / Management in the Chemical Sector May 2016	Not Applicable – the proposed changes solely relate to the replacement of a nitric acid bulk storage tank and a water scrubber. No waste water treatment systems are proposed as part of the changes, and the waste gas aspects are covered by the WGC BATc listed below.	-	N/A
WGC Common Waste Gas Management and Treatment Systems in the Chemical Sector December 2022	Applicable – However note that the WGC BREF and BATc have not yet been enacted in UK law or UK BAT Guidance	S4.2 A1 (a)(iv)	Appendix A Table A1

A detailed review of the proposed site changes against the requirements of the WGC BATc are presented in Appendix A.

The proposed changes at the site relate to the replacement of an existing nitric acid storage tank with a new bunded unit, and the replacement of an existing water scrubber with a new unit for the abatement of potential nitric acid fume within air displaced from the bulk storage tank and nitrogen dioxide extracted from the Mixer 3 plant. No other changes are proposed at the site.

This review of BAT has therefore solely focussed on the implications of the changes proposed.

## 6.0 Waste Handling, Recovery or Disposal

The only new potential waste stream introduced as a result of the proposed changes on site, is contaminated water pumped from the containment bund.

Any water retained within the bund will be pH checked before it is pumped out. If the water is neutral, (i.e. indicating that it is uncontaminated rainwater), it will be discharged to surface water via existing emission point S001. If the water is acidic, (i.e. indicating potential contamination with nitric acid), it will be pumped to an IBC and sent off-site for disposal to a suitably permitted facility ensuring compliance with waste transfer legislation.



## 7.0 In-Process Controls

### 7.1 Instrumentation

A Safety Instrumented System (SIS) will be installed to ensure the safe operation of the nitric acid storage tank when filling from a road tanker and when discharging to the production mixing vessel. A Siemens Safety PLC S7-1500F and two unified HMI panels will be installed to control the storage, vehicle delivery and transfer of nitric acid.

The storage tank will be fitted with a high level switch, low level switch, radar level transmitter and a temperature sensor. The lute pot will have a low level switch fitted. The water scrubber will have a low level switch fitted. The transfer system to the storage tank will have an Automatic Shut Off Valve (ASOV), automatic control valve, conductivity meter, temperature sensor and density sensor fitted. The transfer system to the production mixing vessel will have an automatic control valve, variable speed pump and a flow meter fitted.

### 7.2 Tanker Off-loading

Nitric acid will be delivered to site by road tanker. The tanker off-loading area is of suitable hardstanding as per the existing arrangements. The driver will connect the road tanker to the storage tank filling line using a flexible hose under the supervision of site personnel. Site personnel will use the local HMI to select the storage tank mode of 'delivery', this will automatically start the water scrubber circulation pump. Site personnel will then enter the product code and target quantity into the HMI, the control system will then check that there is sufficient capacity within the storage tank to receive the target quantity. If there is insufficient storage tank capacity, the control system will not allow delivery to commence.

If there is sufficient storage capacity within the storage tank, site personnel will confirm that the road tanker flexible hose is connected correctly and then unlock and open the manual inlet hand valve. This allows the automatic inlet valve to open gravity feeding nitric acid into the conductivity and density monitoring instruments. The control system will check the density and conductivity of the nitric acid and if these criteria are correct, site personnel will then press 'start delivery button' on the HMI and the off-loading transfer route will be open and ready to receive the delivery.

From this point, all operations take place at the road tanker. The driver will control the vehicle's onboard blowing system to control the discharge of the nitric acid which can be monitored on the HMI screen. It is expected that road tankers will off-load at a rate of approximately 40m<sup>3</sup>/hr.

When the tanker has completed off-loading, the driver will stop the tanker onboard blowing system, site personnel will shut the route via the HMI and shut the manual inlet valve and lock it, the driver will disconnect the flexible hose and site personnel will select 'online' mode via the HMI.

### 7.3 Normal Operation

Once the nitric acid delivery has been completed, site personnel will select 'online' mode on the HMI.

When the production mixing vessel requires filling, site personnel will select 'discharge' mode on the HMI. This will enable the control system to open the storage tank discharge valve and start the discharge pump. In normal operation, the control system will stop the



discharge pump and close the discharge valve when the mixing vessel stops requesting nitric acid or the nitric acid storage tank reaches low level. As an extra safeguard, the storage tank transfer line is fitted with a flow meter to protect the discharge pump if no flow is detected.

It will not be possible to select more than one control system operating mode via the HMI at any one time, therefore preventing delivery of nitric acid into the storage tank and discharge from the tank at the same time.

There will also be an Unexpected Emptying Alarm that will monitor the level of the storage tank when it is not in use and an alarm will sound if a drop in level is detected. This will ensure any leaks from the tank are detected in a timely manner and supplement the routine visual checks and the planned preventative maintenance of the storage tank.

If the lute pot low level switch is activated, an alarm will be raised and after a 10 second delay the control system will shut the route. If the water scrubber low level switch is activated, or the recirculation line flow meter does not detect a flow, an alarm will be raised and after a 10 second delay the control system will shut the route.

Both the nitric acid storage tank and the production mixing vessel will have temperature sensors fitted. The high temperature setpoint for both sensors will be 40°C. If these setpoints are exceeded, an alarm will be raised and after a 10 second delay the storage tank discharge pump will stop pumping and the discharge valve will shut.

The water scrubber will have a suction pressure switch installed in the vent line from the mixer. If this switch does not detect a vacuum in the vent line, an alarm will be raised and after a 10 second delay the storage tank discharge pump will stop and the discharge valve will shut.

The nitric acid storage tank containment bund will have a level switch fitted in the sump which will alarm when a predetermined level is reached. Site personnel will check the pH of the water and depending upon the results manually pump the sump out to either surface water discharge point S001 if the pH is neutral or if the pH is acidic to an IBC for off-site disposal.

## 7.4 Overfill Protection

The storage tank will have an overfill protection system consisting of an independent high-high level device fitted to the top of the tank. If this is activated then an alarm will sound and a red beacon fitted by the tanker off-loading point and a further two sets on the control panel and HMI inside the plant building will operate to alert site personnel. After a 10 second delay to allow the tanker driver to turn off the tanker onboard blowing system, the ASOV on the transfer line will shut, closing the off-loading route. The overfill protection system will activate at 95% tank level that ensures that the tank will not physically overfill, therefore there will be no loss of nitric acid.

## 7.5 Water Scrubber System

The water scrubber abatement system is designed to minimise emissions from both the nitric acid storage tank and the production mixing vessel.

The scrubber system consists of a 304L stainless steel vessel, a pump and a fan. The vessel will contain water which will be pumped around the system at a minimum flow rate of 150l/min and comes into contact with the nitric acid vapours that are absorbed into the water. The water will eventually become saturated and will need to be replaced. The water



will be discharged to an IBC for off-site disposal. The water circulation system will be fitted with a conductivity meter which will alarm when the conductivity reaches a setpoint, this will initiate the scrubber water replacement.

The scrubber system will be fitted with a flow meter, low level switch, suction pressure switch and a conductivity meter.

The scrubber system will start automatically when 'delivery' or 'discharge' modes are selected via the HMI. The scrubber system must be running for a delivery to take place.

## **8.0 Emissions**

### **8.1 Point Source Emissions to Air**

Air Emission Point A006 will be relocated as a result of the proposed changes on site.

### **8.2 Point Source Emissions to Water**

No additional point source emissions to water are introduced as a result of the proposed changes on site.

## **9.0 Monitoring**

No amendments to current air emissions monitoring are proposed as a result of the proposed changes on site.

The relocated Emission Point A006 will continue to be monitored in line with the requirements set out in Table S3.1 of the extant EP.

Monitoring facilities associated with the proposed changes on site will be in accordance with Technical Guidance Note M1.

## **10.0 Closure**

The preparation and processing activities undertaken at the site should not lead to a deterioration of the land condition (due to the introduction of any polluting substances) as a result of the protection afforded by the containment and control measures that are in place.

In the unlikely event of a potentially polluting incident which could potentially impact the site, the EHS Manager will record the details of the incident together with any further investigation or remediation work carried out. This will ensure that there is a continuous record of the state of the site throughout the period of the permit.

Records will be maintained of the location of facilities, services, and structures resulting from the proposed changes on site, to allow ease of closure of the site.

The design of the proposed changes ensures that:

- there is provision for the draining and clean out of vessels and pipe work prior to dismantling; and
- materials used are recyclable, if practicable (having regard for operational and other environmental protection objectives).



All supporting equipment manuals and documentation will be maintained in duplicate in hard copy and one electronic version of all documentation and manuals will be kept in the site offices.

The existing Site Closure Plan will be updated accordingly to reflect the proposed changes on site.

## **11.0 Environmental Impact**

### **11.1 Impact Assessments**

An impact assessment has been undertaken in support of this variation application to demonstrate that the operation of the new plant and equipment proposed at the site will not give rise to unacceptable impact on the environment.

The assessment carried out in line with current NRW guidance is as follows;

- Air Emissions Risk Assessment (Section 04).

### **11.2 Environmental Risk Assessment**

The existing Environmental Risk Assessment for the site remains valid as no new risks are introduced as a result of the proposed changes on site.

### **11.3 Air Emissions Risk Assessment**

The conclusions of the detailed atmospheric dispersion modelling assessment of emissions to air on sensitive human and ecological receptor locations arising from installation of a new scrubber abatement system and associated relocation of the emission point A006 are as follows:

- Maximum predicted pollutant concentrations are well below the human health AQALs; and
- Maximum predicted impacts on designated sensitive habitats are considered insignificant.



# **Appendix A    Common Waste Gas Management and Treatment Systems in the Chemical Sector BATc**



**Table A1: Assessment of BAT Compliance – Common Waste Gas Management and Treatment Systems in the Chemical Sector BRef and Associated BAT Conclusions (WGC BRef) – December 2022**

BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
Scope	<p>These BAT conclusions concern the following activity specified in Annex I to Directive 2010/75/EU: 4. Chemical industry (i.e. all production processes included in the categories of activities listed in points 4.1 to 4.6 of Annex I, unless specified otherwise).                      More specifically, these BAT conclusions focus on emissions to air from the aforementioned activity.</p> <p>These BAT conclusions do not address the following:</p> <ol style="list-style-type: none"> <li>1. Emissions to air from the production of chlorine, hydrogen, and sodium/potassium hydroxide by the electrolysis of brine. This is covered by the BAT conclusions for the Production of Chlor-alkali (CAK).</li> <li>2. Channelled emissions to air from the production of the following chemicals in continuous processes where the total production capacity of those chemicals exceeds 20 kt/yr:                             <ul style="list-style-type: none"> <li>— lower olefins using the steam cracking process;</li> <li>— formaldehyde;</li> <li>— ethylene oxide and ethylene glycols;</li> <li>— phenol from cumene;</li> <li>— dinitrotoluene from toluene, toluene diamine from dinitrotoluene, toluene diisocyanate from toluene diamine, methylene diphenyl diamine from aniline, methylene diphenyl diisocyanate from methylene diphenyl diamine;</li> <li>— ethylene dichloride (EDC) and vinyl chloride monomer (VCM);</li> <li>— hydrogen peroxide.</li> </ul> </li> </ol> <p>This is covered by the BAT conclusions for the Production of Large Volume Organic Chemicals (LVOC).</p> <p>However, channelled emissions to air of nitrogen oxides (NO<sub>x</sub>) and carbon monoxide (CO) from thermal treatment of waste gases originating from the aforementioned production processes are included in the scope of these BAT conclusions.</p> <ol style="list-style-type: none"> <li>3. Emissions to air from the production of the following inorganic chemicals:                             <ul style="list-style-type: none"> <li>— ammonia;</li> </ul> </li> </ol>	-	<p>The BRef document applies as the main site activities are defined under Section S4.2 A1 (a)(iv) of Schedule 1 to the Environmental Permitting Regulations 2016.</p>



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<ul style="list-style-type: none"> <li>— ammonium nitrate;</li> <li>— calcium ammonium nitrate;</li> <li>— calcium carbide;</li> <li>— calcium chloride;</li> <li>— calcium nitrate;</li> <li>— carbon black;</li> <li>— ferrous chloride;</li> <li>— ferrous sulphate (i.e. copperas and related products, such as chloro-sulphates);</li> <li>— hydrofluoric acid;</li> <li>— inorganic phosphates;</li> <li>— nitric acid;</li> <li>— nitrogen-, phosphorus- or potassium-based fertilisers (simple or compound fertilisers);</li> <li>— phosphoric acid;</li> <li>— precipitated calcium carbonate;</li> <li>— sodium carbonate (i.e. soda ash);</li> <li>— sodium chlorate;</li> <li>— sodium silicate;</li> <li>— sulphuric acid;</li> <li>— synthetic amorphous silica;</li> <li>— titanium dioxide and related products;</li> <li>— urea;</li> <li>— urea-ammonium nitrate.</li> </ul> <p>This may be covered by the BAT conclusions for the Production of Large Volume Inorganic Chemicals (LVIC).</p> <p>4. Emissions to air from steam reforming as well as from the physical purification and reconcentration of spent sulphuric acid, provided that these processes are directly associated with a production process listed under the aforementioned points 2 or 3.</p>		



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>5. Emissions to air from the production of magnesium oxide using the dry process route. This may be covered by the BAT conclusions for the Production of Cement, Lime and Magnesium Oxide (CLM).</p> <p>6. Emissions to air from the following:</p> <ul style="list-style-type: none"> <li>— Combustion units other than process furnaces/heaters. This may be covered by the BAT conclusions for Large Combustion Plants (LCP), the BAT conclusions for the Refining of Mineral Oil and Gas (REF) and/or by Directive</li> <li>— Process furnaces/heaters with a total rated thermal input below 1 MW.</li> <li>— Process furnaces/heaters used in lower olefins, ethylene dichloride and/or vinyl chloride monomer production referred to in point 2 above. This is covered by the BAT conclusions for the production of Large Volume Organic Chemicals (LVOC).</li> </ul> <p>7. Emissions to air from waste incineration plants. This may be covered by the BAT conclusions for Waste Incineration (WI).</p> <p>8. Emissions to air from the storage, transfer and handling of liquids, liquefied gases and solids, where these are not directly associated with the activity specified in Annex I to Directive 2010/75/EU:4. Chemical industry. This may be covered by the BAT conclusions for Emissions from Storage (EFS).</p> <p>However, emissions to air from the storage, transfer and handling of liquids, liquefied gases and solids are included in the scope of these BAT conclusions provided that these processes are directly associated with the chemical production process specified in the scope of these BAT conclusions.</p> <p>9. Emissions to air from indirect cooling systems. This may be covered by the BAT conclusions for Industrial Cooling Systems (ICS).</p>		
	<p>Summary of applicability of the BAT Conclusions to the Filling Line activities proposed under this application for Variation</p> <p>1.1 General BAT Conclusions - BATc 1 – 23</p> <p>1.2 Polymers and Synthetic Rubbers - BATc 24 - 35</p> <p>1.3 Process Furnaces / Heaters – BATc 36</p>	-	<p>Applicable.</p> <p>Not Applicable.</p> <p>Not Applicable.</p>



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
<b>Environmental Management Systems</b>			
BATc 1	<p>In order to improve the overall environmental performance, BAT is to elaborate and implement an environmental management system (EMS) that incorporates all of the following features:</p> <ul style="list-style-type: none"> <li>i. commitment, leadership, and accountability of the management, including senior management, for the implementation of an effective EMS;</li> <li>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;</li> <li>iii. development of an environmental policy that includes the continuous improvement of the environmental performance of the installation;</li> <li>iv. establishing objectives and performance indicators in relation to significant environmental aspects, including safeguarding compliance with applicable legal requirements;</li> <li>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;</li> <li>vi. determination of structures, roles and responsibilities in relation to environmental aspects and objectives and provision of the financial and human resources needed;</li> <li>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);</li> <li>viii. internal and external communication;</li> <li>ix. fostering employee involvement in good environmental management practices;</li> <li>x. establishing and maintaining a management manual and written procedures to control activities with significant environmental impact as well as relevant records;</li> <li>xi. effective operational planning and process control;</li> <li>xii. implementation of appropriate maintenance programmes;</li> </ul>	Yes	There will be no change to the site Environmental Management System as a result of the proposed changes.



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>xiii. emergency preparedness and response protocols, including the prevention and/or mitigation of the adverse (environmental) impacts of emergency situations;</p> <p>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;</p> <p>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;</p> <p>xvi. application of sectoral benchmarking on a regular basis;</p> <p>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;</p> <p>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;</p> <p>xix. periodic review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;</p> <p>xx. following and taking into account the development of cleaner techniques.</p> <p>Specifically for the chemical sector, BAT is also to incorporate the following features in the EMS:</p> <p>xxi. an inventory of channelled and diffuse emissions to air (see BAT 2);</p> <p>xxii. an OTNOC management plan for emissions to air (see BAT 3);</p> <p>xxiii. an integrated waste gas management and treatment strategy for channelled emissions to air (see BAT 4);</p> <p>xxiv. a management system for diffuse VOC emissions to air (see BAT 19);</p>		



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>xxv. a chemicals management system that includes an inventory of the hazardous substances and substances of very high concern used in the process(es); the potential for substitution of the substances that are listed in this inventory, focusing on those substances other than raw materials, is analysed periodically (e.g., annually) in order to identify possible new available and safer alternatives, with no or lower environmental impacts.</p>		
BATc 2	<p>In order to facilitate the reduction of emissions to air, BAT is to establish, maintain and regularly review (including when a substantial change occurs) an inventory of channelled and diffuse emissions to air, as part of the environmental management system (see BAT 1), that incorporates all of the following features:</p> <p>i. information, as comprehensive as is reasonably possible, about the chemical production process(es), including:</p> <ul style="list-style-type: none"> <li>a. chemical reaction equations, also showing side products;</li> <li>b. simplified process flow sheets that show the origin of the emissions;</li> </ul> <p>ii. information, as comprehensive as is reasonably possible, about channelled emissions to air, such as:</p> <ul style="list-style-type: none"> <li>a. emission point(s);</li> <li>b. average values and variability of flow and temperature;</li> <li>c. average concentration and mass flow values of relevant substances/parameters and their variability (e.g., TVOC, CO, NOX, SOX, Cl<sub>2</sub>, HCl);</li> <li>d. presence of other substances that may affect the waste gas treatment system(s) or plant safety (e.g., oxygen, nitrogen, water vapour, dust);</li> <li>e. techniques used to prevent and/or reduce channelled emissions to air;</li> <li>f. flammability, lower and higher explosive limits, reactivity;</li> <li>g. monitoring methods (see BAT 8);</li> </ul>	Yes	<p>The new water scrubber is to be installed as a replacement for an existing unit (emission point A006). This will not lead to any change in the inventory of channelled emissions to air, although the location of this emission point is to be relocated.</p> <p>The unit has been designed to abate emissions of NO<sub>x</sub> and Nitric acid fume and will comply with the existing NO<sub>x</sub> emission limit of 200 mg/Nm<sup>3</sup>.</p> <p>The proposed changes have been subject to a detailed design process which has included the development of all relevant process and design documentation.</p> <p>i. (a and b) – the proposed changes do not involve any chemical production processes.</p> <p>ii. (a – e and g) – the detailed plant design has considered all of the requirements under these items.</p> <p>ii. (f) – No flammable or explosive materials present in the air emissions via emission point A006.</p> <p>ii. (h) no CMR substances present in the air emissions via emission point A006.</p>



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>h. presence of substances classified as CMR 1A, CMR 1B or CMR 2; the presence of such substances may for example be assessed according to the criteria of Regulation (EC) 1272/2008 on classification, labelling and packaging (CLP).</p> <p>iii. information, as comprehensive as is reasonably possible, about diffuse emissions to air, such as:</p> <ul style="list-style-type: none"> <li>a. identification of the emission source(s);</li> <li>b. characteristics of each emission source (e.g., fugitive or non-fugitive; static or moving; accessibility of the emission source; included in an LDAR programme or not);</li> <li>c. the characteristics of the gas or liquid in contact with the emission source(s), including: <ul style="list-style-type: none"> <li>1) physical state;</li> <li>2) vapour pressure of the substance(s) in the liquid, pressure of the gas;</li> <li>3) temperature;</li> <li>4) composition (by weight for liquids or by volume for gases);</li> <li>5) hazardous properties of the substance(s) or mixtures, including substances or mixtures classified as CMR 1A, CMR 1B or CMR 2;</li> </ul> </li> <li>d. techniques used to prevent and/or reduce diffuse emissions to air;</li> <li>e. monitoring (see BAT 20, BAT 21 and BAT 22).</li> </ul>		<p>iii. No significant diffuse emissions are anticipated – all emissions from the new plant are directed to the water scrubber for emission via emission point A006.</p>
<b>Other Than Normal Operating Conditions (OTNOC)</b>			
BATc 3	<p>In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions to air during OTNOC, BAT is to set up and implement a risk based OTNOC management plan as part of the environmental management system (see BAT 1) that includes all of the following features:</p>	Yes	<p>The proposed changes will not impact on the existing site measures used to prevent and manage OTNOC events.</p> <p>The proposed site changes have been designed with due consideration of OTNOC, and include</p>



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>i. identification of potential OTNOC (e.g., failure of equipment critical to the control of channelled emissions to air, or equipment critical to the prevention of accidents or incidents that could lead to emissions to air (critical equipment)), of their root causes and of their potential consequences;</p> <p>ii. appropriate design of critical equipment (e.g., equipment modularity and compartmentalisation, backup systems, techniques to obviate the need to bypass waste gas treatment during start-up and shutdown, high-integrity equipment, etc.);</p> <p>iii. set-up and implementation of a preventive maintenance plan for critical equipment (see BAT 1 xii.);</p> <p>iv. monitoring (i.e., estimating or, where this is possible, measuring) and recording of emissions and associated circumstances during OTNOC;</p> <p>v. periodic assessment of the emissions occurring during OTNOC (e.g., frequency of events, duration, amount of pollutants emitted as recorded in point iv.) and implementation of corrective actions if necessary;</p> <p>vi. regular review and update of the list of identified OTNOC under point i. following the periodic assessment of point v.;</p> <p>vii. regular testing of backup systems.</p>		<p>control measures to minimise the potential for abnormal emissions to air e.g.:</p> <ul style="list-style-type: none"> <li>• Inlet air – pressure;</li> <li>• Scrubber water - low level;</li> <li>• Scrubber water – low or no flow;</li> <li>• Scrubber Water - conductivity;</li> </ul> <p>The control systems for the nitric acid tank and the water scrubber system include interlocks that will limit or cease the generation of emissions feeding into the unit e.g.</p> <ul style="list-style-type: none"> <li>• Low scrubber water level or flow would lead to closure of the offloading valve and prevent / cease road tanker delivery offload;</li> <li>• Scrubber fan inlet high pressure would close the inlet valve on the nitric acid line to Mixer 3 – thus preventing the addition of nitric acid, and hence preventing generation for further vapours;</li> <li>• etc.</li> </ul> <p>An OTNOC management plan will be utilised to minimise the risk of OTNOC.</p> <p>i. Identification of potential OTNOC has been undertaken through safety review of the new systems including HAZOP / PHA. In the event of an OTNOC scenario, an incident investigation would be undertaken to</p>



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
			ascertain the route cause and initiate preventative measures. ii. The new plant has been designed to include either back-up systems, or control measures to prevent / control potential emissions in the event of OTNOC. iii. A pre-planned maintenance system will be in place for all equipment. iv. As continuous emissions monitoring is not to be undertaken on emission point A006 – there will not be any system in place to monitor emissions during OTNOC events – prioritisation will be given to rectifying the situation. v. As iv above. vi. Periodic review of potential OTNOC scenarios and the measures used to prevent / control them will be undertaken. vii. Back-up systems will be tested regularly as part of the pre-planned maintenance system.
<b>Channelled Emissions To Air</b>			
BATc 4	In order to reduce channelled emissions to air, BAT is to use an integrated waste gas management and treatment strategy that includes, in order of priority, process integrated recovery and abatement techniques.	Yes	Emissions associated with the proposed plant changes are limited to air vented from 2 sources:



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>The integrated waste gas management and treatment strategy is based on the inventory in BAT 2. It takes into account factors such as greenhouse gas emissions and the consumption or reuse of energy, water and materials associated with the use of the different techniques.</p>		<ul style="list-style-type: none"> <li>• Bulk Nitric acid storage tank (breather and filling headspace displacement); and</li> <li>• Mixer 3 - headspace displacement during filling and extraction during process operation.</li> </ul> <p>The gas management strategy for these emissions is to direct them to the water scrubber to abate NOx and Nitric acid fume prior to venting to air which is unchanged from current operations.</p>
BATc 5	<p>In order to facilitate the recovery of materials and the reduction of channelled emissions to air, as well as to increase energy efficiency, BAT is to combine waste gas streams with similar characteristics, thus minimising the number of emission points</p>	Yes	<p>The water scrubber will receive air from 2 sources:</p> <ul style="list-style-type: none"> <li>• Bulk Nitric acid storage tank (breather and filling headspace displacement); and</li> <li>• Mixer 3 - headspace displacement during filling and extraction during process operation.</li> </ul> <p>There are no other emission sources that could be added.</p>
BATc 6	<p>In order to reduce channelled emissions to air, BAT is to ensure that the waste gas treatment systems are appropriately designed (e.g., considering the maximum flow rate and pollutant concentrations), operated within their design ranges, and maintained (through preventive, corrective, regular and unplanned maintenance) so as to ensure optimal availability, effectiveness and efficiency of the equipment.</p>	Yes	<p>The water scrubber system has been designed to handle the full range of operational scenarios which could credibly occur i.e.</p> <p>Maximum flowrates of :</p> <ul style="list-style-type: none"> <li>• 105 m<sup>3</sup>/hr (gas inlet from storage tank),</li> <li>• 4,500 m<sup>3</sup>/hr (gas inlet from mixer); and</li> <li>• 1.5 m<sup>3</sup>/hr (gas inlet from inbreathing).</li> </ul>



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
			The water scrubber system will be subject to a pre-planned maintenance schedule to achieve optimal availability, effectiveness and efficiency of the equipment.
<b>Monitoring</b>			
BATc 7	BAT is to continuously monitor key process parameters (e.g., waste gas flow and temperature) of waste gas streams being sent to pre-treatment and/or final treatment.	N/A	<p>Monitoring of waste gas streams to the wet scrubber is not considered to be necessary as the emission sources are well understood and are unlikely to have significant variance in the emissions generated.</p> <p>Flow to the wet scrubber is determined by the capacity of the scrubber fan – so no monitoring of flow is required.</p> <p>The water scrubber system is installed with monitoring and control systems for key process parameters interlocked to the control system to ensure its effective operation e.g.</p> <ul style="list-style-type: none"> <li>• Inlet air – pressure;</li> <li>• Scrubber water – level;</li> <li>• Scrubber water – flow;</li> <li>• Scrubber water conductivity.</li> </ul>
BATc 8	BAT is to monitor channelled emissions to air 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.	Yes	<p>Monitoring of emission point A006 is proposed to continue to be undertaken in accordance with the existing permit requirements i.e. Monitoring on Oxides of Nitrogen will be undertaken annually via spot sample in accordance with BS EN 14792.</p>



BATc No.	BAT Justification						Operating to BAT	Demonstration of BAT Compliance
	Substance / Parameter <sup>(1)</sup>	Process(es) / Source(s)	Emission Points	Standard(s) <sup>(2)</sup>	Minimum Monitoring Frequency	Monitoring Associated With		
	Ammonia (NH <sub>3</sub> )	Use of SCR/SNCR	Any stack	EN 21877	Once every 6 months <sup>(3)</sup> <sup>(4)</sup>	BAT 17	<p>It is noted that BATc 8 advises that monitoring every 6 months is required for mass emissions of NOx of &lt;2.5 kg/hour. The predicted maximum NOx emission rate from the process is 900 g/h.</p> <p>However, Note 4 to BATc 8 identifies that “The minimum monitoring frequency may be reduced to once every year or once every 3 years if the emission levels are proven to be sufficiently stable.”</p> <p>Emissions via A006 only occur when the specific production process is operating, which currently is typically &lt;5% of the year, and the abatement system only receives emissions from a well understood and stable process where the generation of the emissions source can be controlled via the feed rate of nitric acid into the process. Emissions of NOx from the Mixer process (when operating) are therefore expected to be stable, and given the frequency of emissions, it is considered that annual monitoring is sufficient.</p>	
		All other processes / sources				BAT 18		
	Benzene	All processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	1,3-Butadiene	All processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Carbon monoxide (CO)	Thermal treatment	Any stack with a CO mass flow of ≥ 2 kg/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 16		
			Any stack with a CO mass flow of < 2 kg/h	EN 15058	Once every 6 months <sup>(3)(4)</sup>			
		Process furnace/heaters	Any stack with a CO mass flow of ≥ 2 kg/h	Generic EN standards <sup>(5)</sup>	Continuous <sup>(6)</sup>	BAT 36		
			Any stack with a CO mass flow of < 2 kg/h	EN 15058	Once every 6 months <sup>(3)(4)</sup>			
		All other processes / sources	Any stack with a CO mass flow of ≥ 2 kg/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 18		



BATc No.	BAT Justification						Operating to BAT	Demonstration of BAT Compliance
			Any stack with a CO mass flow of < 2 kg/h	EN 15058 X	Once every 6 months <sup>(3)(7)</sup>			
	Chloromethane	All processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	CMR substances other than CMR substances covered elsewhere in this table <sup>(12)</sup>	All other processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Dichloromethane	All processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Dust	All processes / sources	Any stack with dust mass flow ≥ 3 kg/h	Generic EN standards <sup>(5)</sup> , EN 13284-1 and EN 13284-2	Continuous <sup>(8)</sup>	BAT 14		
			Any stack with dust mass flow < 3 kg/h	EN 13284-1	Once every year <sup>(3)(7)</sup>			
	Elemental chlorine (Cl <sub>2</sub> )	All other processes / sources	Any stack	No EN standard available	Once every year <sup>(3)(7)</sup>	BAT 18		



BATc No.	BAT Justification						Operating to BAT	Demonstration of BAT Compliance
	Ethylene dichloride (EDC)	All other processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Ethylene oxide	All other processes / sources	Any stack	No EN standard available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Formaldehyde	All other processes / sources	Any stack	EN standard under development	Once every 6 months <sup>(3)</sup>	BAT 11		
	Gaseous chlorides	All other processes / sources	Any stack	EN 1911	Once every year <sup>(3)(7)</sup>	BAT 18		
	Gaseous fluorides	All other processes / sources	Any stack	No EN standard available	Once every year <sup>(3)(7)</sup>	BAT 18		
	Hydrogen cyanide (HCN)	All other processes / sources	Any stack	No EN standard available	Once every year <sup>(3)(7)</sup>	BAT 18		
	Lead and its compounds	All other processes / sources	Any stack	EN 14385	Once every 6 months <sup>(3)(9)</sup>	BAT 14		
	Nickel and its compounds	All other processes / sources	Any stack	EN 14385	Once every 6 months <sup>(3)(9)</sup>	BAT 14		
	Nitrous Oxide (N <sub>2</sub> O)	All other processes / sources	Any stack	EN ISO 21258	Once every year <sup>(3)(7)</sup>	-		
	Nitrogen oxides (NO <sub>x</sub> )	Thermal treatment	Any stack with a NO <sub>x</sub> mass flow of ≥ 2.5 kg/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 16		
Any stack with a NO <sub>x</sub> mass flow of <2.5 kg/h			EN 14792	Once every 6 months <sup>(3)(4)</sup>				
Process furnace / heaters		Any stack with a NO <sub>x</sub>	Generic EN standards <sup>(5)</sup>	Continuous <sup>(6)</sup>	BAT 36			



BATc No.	BAT Justification						Operating to BAT	Demonstration of BAT Compliance
			mass flow of $\geq 2.5$ kg/h					
			Any stack with a NO <sub>x</sub> mass flow of <2.5 kg/h	EN 14792	Once every 6 months <sup>(3)(4)</sup>			
		All other processes / sources	Any stack with a NO <sub>x</sub> mass flow of $\geq 2.5$ kg/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 18		
			Any stack with a NO <sub>x</sub> mass flow of <2.5 kg/h	EN 14792	Once every 6 months <sup>(3)(4)</sup>			
	PCDD/F	Thermal treatment	Any stack	EN 1948-1, XEN 1948-2, EN 1948-3	Once every 6 months <sup>(3)(9)</sup>	BAT 12		
	PM <sub>2.5</sub> and PM <sub>10</sub>	All processes / sources	Any stack	EN ISO 23210	Once every year <sup>(3)(7)</sup>	BAT 14		
	Propylene oxide	All processes / sources	Any stack	No EN standards available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Sulphur dioxide (SO <sub>2</sub> )	Thermal treatment	Any stack with a SO <sub>2</sub> mass flow of $\geq 2.5$ kg/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 16		
			Any stack with a SO <sub>2</sub> mass flow of <2.5kg/h	EN 14791	Once every 6 months <sup>(3)(4)</sup>			
		Process furnaces / heaters	Any stack with a SO <sub>2</sub> mass flow of $\geq 2.5$ kg/h	Generic EN standards <sup>(5)</sup>	Continuous <sup>(6)</sup>	BAT 18, BAT 36		



BATc No.	BAT Justification						Operating to BAT	Demonstration of BAT Compliance
			Any stack with a SO <sub>2</sub> mass flow of <2.5kg/h	EN 14791	Once every 6 months <sup>(3)(4)</sup>			
		All other processes / sources	Any stack with a SO <sub>2</sub> mass flow of ≥ 2.5 kg/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 18		
			Any stack with a SO <sub>2</sub> mass flow of <2.5kg/h	EN 14791 X	Once every 6 months <sup>(3)(4)</sup>			
	Tetrachloromethane	All processes / sources	Any stack	No EN standards available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Toluene	All processes / sources	Any stack	No EN standards available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Trichloromethane	All processes / sources	Any stack	No EN standards available	Once every 6 months <sup>(3)</sup>	BAT 11		
	Total volatile organic carbon (TVOC)	Production of polyolefins <sup>(10)</sup>	Any stack with a TVOC mass flow of ≥ 2 kg C/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 11, BAT 25		
			Any stack with a TVOC mass flow of < 2 kg C/h	EN 12619	Once every 6 months <sup>(3)(4)</sup>			
		Production of synthetic rubber <sup>(11)</sup>	Any stack with a TVOC mass flow of ≥ 2 kg C/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 11, BAT 32		



BATc No.	BAT Justification						Operating to BAT	Demonstration of BAT Compliance
			Any stack with a TVOC mass flow of < 2 kg C/h	EN 12619	Once every 6 months <sup>(3)(4)</sup>			
		All other processes / sources	Any stack with a TVOC mass flow of ≥ 2 kg C/h	Generic EN standards <sup>(5)</sup>	Continuous	BAT 11		
			Any stack with a TVOC mass flow of < 2 kg C/h	EN 12619	Once every 6 months <sup>(3)(4)</sup>			
	<p>(1) The monitoring only applies when the substance/parameter concerned is identified as relevant in the waste gas stream based on the inventory given in BAT 2.</p> <p>(2) Measurements are carried out according to EN 15259.</p> <p>(3) To the extent possible, the measurements are carried out at the highest expected emission state under normal operating conditions.</p> <p>(4) The minimum monitoring frequency may be reduced to once every year or once every 3 years if the emission levels are proven to be sufficiently stable.</p> <p>(5) Generic EN standards for continuous measurements are EN 14181, EN 15267-1, EN 15267-2 and EN 15267-3.</p> <p>(6) In the case of process furnaces/heaters with a total rated thermal input of less than 100 MW operated less than 500 hours per year, the minimum monitoring frequency may be reduced to once every year.</p> <p>(7) The minimum monitoring frequency may be reduced to once every 3 years if the emission levels are proven to be sufficiently stable.</p> <p>(8) The minimum monitoring frequency may be reduced to once every 6 months if the emission levels are proven to be sufficiently stable.</p> <p>(9) The minimum monitoring frequency may be reduced to once every year if the emission levels are proven to be sufficiently stable.</p> <p>(10) In the case of the production of polyolefins, the monitoring of TVOC emissions from finishing steps (e.g., drying, blending) and from polymer storage may be complemented by the monitoring in BAT 24 if it provides a better representation of the TVOC emissions.</p> <p>(11) In the case of the production of synthetic rubbers, the monitoring of TVOC emissions from finishing steps (e.g., extrusion, drying, blending) and from synthetic rubber storage may be complemented by the monitoring in BAT 31 if it provides a better representation of the TVOC emissions.</p> <p>(12) i.e., other than benzene, 1,3-butadiene, chloromethane, dichloromethane, ethylene dichloride, ethylene oxide, formaldehyde, propylene oxide, tetrachloromethane, toluene, trichloromethane.</p>							



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance															
Organic Compounds																		
BATc 9	<p>In order to increase resource efficiency and to reduce the mass flow of organic compounds sent to the final waste gas treatment, BAT is to recover organic compounds from process off-gases by using one or a combination of the techniques given below and to reuse them.</p> <table border="1"> <thead> <tr> <th colspan="2">Techniques</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>a.</td> <td>Absorption (regenerative)</td> <td>See Section 1.4.1.</td> </tr> <tr> <td>b.</td> <td>Adsorption (regenerative)</td> <td>See Section 1.4.1.</td> </tr> <tr> <td>c.</td> <td>Condensation</td> <td>See Section 1.4.1.</td> </tr> </tbody> </table>	Techniques		Description	a.	Absorption (regenerative)	See Section 1.4.1.	b.	Adsorption (regenerative)	See Section 1.4.1.	c.	Condensation	See Section 1.4.1.	N/A	Not applicable – Inorganic chemicals process. No organic compounds present in the emissions from the water scrubber (emission point A006).			
Techniques		Description																
a.	Absorption (regenerative)	See Section 1.4.1.																
b.	Adsorption (regenerative)	See Section 1.4.1.																
c.	Condensation	See Section 1.4.1.																
BATc 10	<p>In order to increase energy efficiency and to reduce the mass flow of organic compounds sent to the final waste gas treatment, BAT is to send process off-gases with a sufficient calorific value to a combustion unit that is, if technically possible, combined with heat recovery. BAT 9 has priority over sending process off-gases to a combustion unit.</p>	N/A	Not applicable – Inorganic chemicals process. No organic compounds present in the emissions from the water scrubber (emission point A006).															
BATc 11	<p>In order to reduce channelled emissions to air of organic compounds, BAT is to use one or a combination of the techniques given below.</p> <table border="1"> <thead> <tr> <th>Technique</th> <th>Description</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a.</td> <td>Adsorption</td> <td>See Section 1.4.1. Generally applicable.</td> </tr> <tr> <td>b.</td> <td>Absorption</td> <td>See Section 1.4.1. Generally applicable.</td> </tr> <tr> <td>c.</td> <td>Catalytic oxidation</td> <td>See Section 1.4.1. Applicability may be restricted by the presence of catalyst poisons in the waste gases.</td> </tr> <tr> <td>d.</td> <td>Condensation</td> <td>See Section 1.1.1. Generally applicable.</td> </tr> </tbody> </table>	Technique	Description	Applicability	a.	Adsorption	See Section 1.4.1. Generally applicable.	b.	Absorption	See Section 1.4.1. Generally applicable.	c.	Catalytic oxidation	See Section 1.4.1. Applicability may be restricted by the presence of catalyst poisons in the waste gases.	d.	Condensation	See Section 1.1.1. Generally applicable.	N/A	Not applicable – Inorganic chemicals process. No organic compounds present in the emissions from the water scrubber (emission point A006).
Technique	Description	Applicability																
a.	Adsorption	See Section 1.4.1. Generally applicable.																
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d.	Condensation	See Section 1.1.1. Generally applicable.																



BATc No.	BAT Justification			Operating to BAT	Demonstration of BAT Compliance																
	e.	Thermal oxidation	See Section 1.1.1.	Applicability of recuperative and regenerative thermal oxidation to existing plants may be restricted by design and/or operational constraints. Applicability may be restricted where the energy demand is excessive due to the low concentration of the compound(s) concerned in the process off-gases.																	
	f.	Bioprocesses	See Section 1.4.1	Only applicable to the treatment of biodegradable compounds.																	
<p>BAT-associated emission levels (BAT-AELs) for channelled emissions to air of organic compounds.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #92d050;"> <th style="text-align: left;">Substance / Parameter</th> <th style="text-align: left;">BAT-AEL (mg/Nm<sup>3</sup>) Daily average or average over the sampling period <sup>(1)</sup></th> </tr> </thead> <tbody> <tr> <td>Total volatile organic carbon (TVOC)</td> <td>&lt; 1 – 20 <sup>(2)(3)(4)(5)</sup></td> </tr> <tr> <td>Sum of VOCs classified as CMR 1A or 1B</td> <td>&lt; 1 - 5 <sup>(6)</sup></td> </tr> <tr> <td>Sum of VOCs classified as CMR 2</td> <td>&lt; 1 - 10 <sup>(7)</sup></td> </tr> <tr> <td>Benzene</td> <td>&lt; 0.5 - 1 <sup>(8)</sup></td> </tr> <tr> <td>1,3-Butadiene</td> <td>&lt; 0.5 - 1 <sup>(8)</sup></td> </tr> <tr> <td>Ethylene dichloride</td> <td>&lt; 0.5 - 1 <sup>(8)</sup></td> </tr> <tr> <td>Ethylene oxide</td> <td>&lt;0.5 – 1<sup>(8)</sup></td> </tr> </tbody> </table>						Substance / Parameter	BAT-AEL (mg/Nm <sup>3</sup> ) Daily average or average over the sampling period <sup>(1)</sup>	Total volatile organic carbon (TVOC)	< 1 – 20 <sup>(2)(3)(4)(5)</sup>	Sum of VOCs classified as CMR 1A or 1B	< 1 - 5 <sup>(6)</sup>	Sum of VOCs classified as CMR 2	< 1 - 10 <sup>(7)</sup>	Benzene	< 0.5 - 1 <sup>(8)</sup>	1,3-Butadiene	< 0.5 - 1 <sup>(8)</sup>	Ethylene dichloride	< 0.5 - 1 <sup>(8)</sup>	Ethylene oxide	<0.5 – 1 <sup>(8)</sup>
Substance / Parameter	BAT-AEL (mg/Nm <sup>3</sup> ) Daily average or average over the sampling period <sup>(1)</sup>																				
Total volatile organic carbon (TVOC)	< 1 – 20 <sup>(2)(3)(4)(5)</sup>																				
Sum of VOCs classified as CMR 1A or 1B	< 1 - 5 <sup>(6)</sup>																				
Sum of VOCs classified as CMR 2	< 1 - 10 <sup>(7)</sup>																				
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1,3-Butadiene	< 0.5 - 1 <sup>(8)</sup>																				
Ethylene dichloride	< 0.5 - 1 <sup>(8)</sup>																				
Ethylene oxide	<0.5 – 1 <sup>(8)</sup>																				



BATc No.	BAT Justification		Operating to BAT	Demonstration of BAT Compliance
	Propylene oxide	<0.5 – 1 <sup>(8)</sup>		
	Formaldehyde	1 - 5 <sup>(8)</sup>		
	Chloromethane	< 0.5 - 1 <sup>(9)(10)</sup>		
	Dichloromethane	< 0.5 - 1 <sup>(9)(10)</sup>		
	Tetrachloromethane	< 0.5 - 1 <sup>(9)(10)</sup>		
	Toluene	< 0.5 - 1 <sup>(9)(11)</sup>		
	Trichloromethane	< 0.5 - 1 <sup>(9)(10)</sup>		
	<p>(1) For activities listed under points 8 and 10, Part 1 of Annex VII of the IED, the BAT-AEL ranges apply to the extent that they lead to lower emission levels than the emission limit values in part 2 and 4 of Annex VII to the IED.</p> <p>(2) TVOC is expressed in mg C/Nm<sup>3</sup>.</p> <p>(3) In the case of polymer production, the BAT-AEL may not apply to emissions from the finishing steps (e.g., extrusion, drying, blending) and from polymer storage.</p> <p>(4) The BAT-AEL does not apply to minor emissions (i.e., when the TVOC mass flow is below e.g., 100 g C/h) if no CMR substances are identified as relevant in the waste gas stream based on the inventory given in BAT 2.</p> <p>(5) The upper end of the BAT-AEL range may be higher and up to 30 mg C/Nm<sup>3</sup> when using techniques to recover materials (e.g., solvents, see BAT 9), if both of the following conditions are fulfilled:</p> <ul style="list-style-type: none"> <li>• the presence of substances classified as CMR 1A/1B or CMR 2 is identified as not relevant (see BAT 2);</li> <li>• the TVOC abatement efficiency of the waste gas treatment system is ≥ 95 %.</li> </ul> <p>(6) The BAT-AEL does not apply to minor emissions (i.e., when the mass flow of the sum of the VOCs classified as CMR 1A or 1B is below e.g., 1 g/h).</p> <p>(7) The BAT-AEL does not apply to minor emissions (i.e., when the mass flow of the sum of the VOCs classified as CMR 2 is below e.g., 50 g/h).</p> <p>(8) The BAT-AEL does not apply to minor emissions (i.e., when the mass flow of the substance concerned is below e.g., 1 g/h).</p>			



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance																		
	<p>(9) The BAT-AEL does not apply to minor emissions (i.e., when the mass flow of the substance concerned is below e.g., 50 g/h).</p> <p>(10) The upper end of the BAT-AEL range may be higher and up to 15 mg/Nm<sup>3</sup> when using techniques to recover materials (e.g., solvents, see BAT 9), if the abatement efficiency of the waste gas treatment system is ≥ 95 %.</p> <p>(11) The upper end of the BAT-AEL range may be higher and up to 20 mg/Nm<sup>3</sup> when using techniques to recover toluene (see BAT 9), if the abatement efficiency of the waste gas treatment system is ≥ 95 %.</p>																				
BATc 12	<p>In order to reduce channelled emissions to air of PCDD/F from thermal treatment of waste gases containing chlorine and/or chlorinated compounds, BAT is to use techniques a. and b., and one or a combination of techniques c. to e., given below.</p> <table border="1" data-bbox="315 794 1373 1335"> <thead> <tr> <th data-bbox="315 794 412 834">Technique</th> <th data-bbox="412 794 752 834">Description</th> <th data-bbox="752 794 1055 834">Applicability</th> </tr> </thead> <tbody> <tr> <td colspan="3" data-bbox="315 834 1373 866"><i>Specific techniques to reduce PCDD/F emissions</i></td> </tr> <tr> <td data-bbox="315 866 412 930">a.</td> <td data-bbox="412 866 752 930">Optimised catalytic or thermal oxidation</td> <td data-bbox="752 866 1055 930">See Section 1.4.1</td> </tr> <tr> <td data-bbox="315 930 412 1190">b.</td> <td data-bbox="412 930 752 1190">Rapid waste-gas cooling</td> <td data-bbox="752 930 1055 1190">Rapid cooling of waste gases from temperatures above 400 °C to below 250 °C to prevent the de novo synthesis of PCDD/F.</td> </tr> <tr> <td data-bbox="315 1190 412 1286">c.</td> <td data-bbox="412 1190 752 1286">Adsorption using activated carbon.</td> <td data-bbox="752 1190 1055 1286">See Section 1.4.1.</td> </tr> <tr> <td data-bbox="315 1286 412 1335">d.</td> <td data-bbox="412 1286 752 1335">Absorption</td> <td data-bbox="752 1286 1055 1335">See Section 1.4.1.</td> </tr> </tbody> </table>	Technique	Description	Applicability	<i>Specific techniques to reduce PCDD/F emissions</i>			a.	Optimised catalytic or thermal oxidation	See Section 1.4.1	b.	Rapid waste-gas cooling	Rapid cooling of waste gases from temperatures above 400 °C to below 250 °C to prevent the de novo synthesis of PCDD/F.	c.	Adsorption using activated carbon.	See Section 1.4.1.	d.	Absorption	See Section 1.4.1.	N/A	<p>Not applicable. No PCDD/F present in the emissions from the water scrubber (emission point A006).</p>
Technique	Description	Applicability																			
<i>Specific techniques to reduce PCDD/F emissions</i>																					
a.	Optimised catalytic or thermal oxidation	See Section 1.4.1																			
b.	Rapid waste-gas cooling	Rapid cooling of waste gases from temperatures above 400 °C to below 250 °C to prevent the de novo synthesis of PCDD/F.																			
c.	Adsorption using activated carbon.	See Section 1.4.1.																			
d.	Absorption	See Section 1.4.1.																			



BATc No.	BAT Justification			Operating to BAT	Demonstration of BAT Compliance
	<i>Other techniques not primarily used to reduce PCDD/F emissions</i>				
	e.	Selective catalytic reduction (SCR)	See Section 1.4.1. When SCR is used for NOX abatement, an adequate catalyst surface of the SCR system also provides for the partial reduction of the emissions of PCDD/F.	Applicability to existing plants may be restricted by space availability and/or by the presence of catalyst poisons in the waste gases.	
	BAT-associated emission level (BAT-AEL) for channelled emissions to air of PCDD/F from thermal treatment of waste gases containing chlorine and/or chlorinated compounds.				
	<b>Substance / Parameter</b>		<b>BAT-AEL (ng I-TEQ / Nm<sup>3</sup>) Average over the sampling period</b>		
	PCDD/F		< 0.01 - 0.05		
BATc 13	In order to increase resource efficiency and to reduce the mass flow of dust and particulate-bound metals sent to the final waste gas treatment, BAT is to recover materials from process off-gases by using one or a combination of the techniques given below and to reuse them.			N/A	Not applicable. No dust present in the emissions from the water scrubber (emission point A006).
	<b>Techniques</b>		<b>Description</b>		
	a.	Cyclone	See Section 1.4.1.		
	b.	Fabric filter	See Section 1.4.1.		
	c.	Absorption	See Section 1.4.1.		
BATc 14	In order to reduce channelled emissions to air of dust and particulate-bound metals, BAT is to use one or a combination of the techniques given below.			N/A	Not applicable. No dust and particulate-bound metals present in the emissions from the water scrubber (emission point A006).



BATc No.	BAT Justification			Operating to BAT	Demonstration of BAT Compliance	
	<b>Techniques</b>		<b>Description</b>	<b>Applicability</b>		
	a.	Absolute filter	See Section 1.4.1.	Applicability may be limited in the case of sticky dust or when the temperature of the waste gases is below the dew point.		
	b.	Absorption	See Section 1.4.1.	General applicable.		
	c.	Fabric filter	See Section 1.4.1.	Applicability may be limited in the case of sticky dust or when the temperature of the waste gases is below the dew point.		
	d.	High-efficiency air filter	See Section 1.4.1.	General applicable.		
	e.	Cyclone	See Section 1.4.1.	General applicable.		
	f.	Electrostatic precipitator	See Section 1.4.1.	General applicable.		
	<p>BAT-associated emission levels (BAT-EALs) for channelled emissions to air of dust, lead, and nickel.</p>					
	<b>Substance / Parameter</b>		<b>BAT-AEL (mg/Nm<sup>3</sup>) Daily average or average over the sampling period</b>			
	Dust		< 1 - 5 <sup>(1)(2)(3)(4)</sup>			
Lead and its compounds, expressed as Pb		< 0.01 - 0.1 <sup>(5)</sup>				
Nickel and its compounds, expressed as Ni		< 0.02 - 0.1 <sup>(6)</sup>				



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance															
	<p>(1) The upper end of the range is 20 mg/Nm<sup>3</sup> when either an absolute or a fabric filter is not applicable.</p> <p>(2) The BAT-AEL does not apply to minor emissions (i.e., when the dust mass flow is below e.g., 50 g/h) if no CMR substances are identified as relevant in the dust based on the inventory given in BAT 2.</p> <p>(3) In the case of the production of complex inorganic pigments using direct heating, and in the case of the drying step in the production of E-PVC, the upper end of the BAT-AEL range may be higher and up to 10 mg/Nm<sup>3</sup>.</p> <p>(4) Dust emissions are expected to be towards the lower end of the BAT-AEL range (e.g., below 2.5 mg/Nm<sup>3</sup>) when the presence of substances classified as CMR 1A or 1B, or CMR 2 in the dust is identified as relevant (see BAT 2).</p> <p>(5) The BAT-AEL does not apply to minor emissions (i.e., when the lead mass flow is below e.g., 0.1 g/h).</p> <p>(6) The BAT-AEL does not apply to minor emissions (i.e., when the Ni mass flow is below e.g., 0.15 g/h).</p>																	
<b>Inorganic Compounds</b>																		
BATc 15	In order to increase resource efficiency and to reduce the mass flow of inorganic compounds sent to the final waste gas treatment, BAT is to recover inorganic compounds from process off-gases by using absorption and to reuse them.	N/A	The wet scrubber operates to abate emissions of NO <sub>x</sub> and nitric acid vapour, these materials are absorbed into the scrubber water which periodically changed out. The waste water is not suitable for re-use in the process as it is too dilute and will be of variable quality and composition.															
BATc 16	In order to reduce channelled emissions to air of CO, NO <sub>x</sub> and SO <sub>x</sub> from thermal treatment, BAT is to use technique c. and one or a combination of the other techniques given below.	N/A	Not applicable No thermal treatment of emissions															
	<table border="1"> <thead> <tr> <th></th> <th>Technique</th> <th>Description</th> <th>Main Inorganic Compounds Targeted</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td>a.</td> <td>Choice of fuel</td> <td>See Section 1.4.1.</td> <td>NO<sub>x</sub>, SO<sub>x</sub></td> <td>Generally applicable.</td> </tr> <tr> <td>b.</td> <td>Low-NO<sub>x</sub> burner</td> <td>See Section 1.4.1.</td> <td>NO<sub>x</sub></td> <td>Applicability to existing plants may be restricted by design and/or operational constraints.</td> </tr> </tbody> </table>		Technique	Description	Main Inorganic Compounds Targeted	Applicability	a.	Choice of fuel	See Section 1.4.1.	NO <sub>x</sub> , SO <sub>x</sub>	Generally applicable.	b.	Low-NO <sub>x</sub> burner	See Section 1.4.1.	NO <sub>x</sub>	Applicability to existing plants may be restricted by design and/or operational constraints.		
	Technique	Description	Main Inorganic Compounds Targeted	Applicability														
a.	Choice of fuel	See Section 1.4.1.	NO <sub>x</sub> , SO <sub>x</sub>	Generally applicable.														
b.	Low-NO <sub>x</sub> burner	See Section 1.4.1.	NO <sub>x</sub>	Applicability to existing plants may be restricted by design and/or operational constraints.														



BATc No.	BAT Justification				Operating to BAT	Demonstration of BAT Compliance							
	c.	Optimisation of catalytic or thermal oxidation	See Section 1.4.1.	CO, NOx	Generally applicable.								
	d.	Removal of high levels of NOx precursors	Remove (if possible, for reuse) high levels of NOx precursors prior to thermal or catalytic oxidation, e.g., by absorption, adsorption or condensation.	NOx	Generally applicable.								
	e.	Absorption	See Section 1.4.1.	SOx	Generally applicable.								
	f.	Selective catalytic reduction (SCR)	See Section 1.4.1.	NOx	Applicability to existing plants may be restricted by space availability.								
	g.	Selective non catalytic reduction (SNCR)	See Section 1.4.1.	NOx	Applicability to existing plants may be restricted by the residence time needed for the reaction.								
	<p>BAT-associated emission levels (BAT-AELs) for channelled emissions to air of NOx and indicative level for channelled emissions to air of CO from thermal treatment</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #c8e6c9;"> <th style="text-align: center;">Substance / Parameter</th> <th style="text-align: center;">BAT-AEL (mg/Nm<sup>3</sup>) (Daily average or average over the sampling period)</th> </tr> </thead> <tbody> <tr> <td>Nitrogen oxides (NOx) from catalytic oxidation</td> <td style="text-align: center;">5 - 30 <sup>(1)</sup></td> </tr> <tr> <td>Nitrogen oxides (NOx) from thermal oxidation</td> <td style="text-align: center;">5 – 130 <sup>(2)</sup></td> </tr> <tr> <td>Carbon monoxide (CO)</td> <td style="text-align: center;">No BAT-AEL <sup>(3)</sup></td> </tr> </tbody> </table> <p>(1) The upper end of the BAT-AEL range may be higher and up to 80 mg/Nm<sup>3</sup> if the process off-gas(es) contain(s) high levels of NOx precursors.                      (2) The upper end of the BAT-AEL range may be higher and up to 200 mg/Nm<sup>3</sup> if the process off-gas(es) contain(s) high levels of NOx precursors.</p>						Substance / Parameter	BAT-AEL (mg/Nm <sup>3</sup> ) (Daily average or average over the sampling period)	Nitrogen oxides (NOx) from catalytic oxidation	5 - 30 <sup>(1)</sup>	Nitrogen oxides (NOx) from thermal oxidation	5 – 130 <sup>(2)</sup>	Carbon monoxide (CO)
Substance / Parameter	BAT-AEL (mg/Nm <sup>3</sup> ) (Daily average or average over the sampling period)												
Nitrogen oxides (NOx) from catalytic oxidation	5 - 30 <sup>(1)</sup>												
Nitrogen oxides (NOx) from thermal oxidation	5 – 130 <sup>(2)</sup>												
Carbon monoxide (CO)	No BAT-AEL <sup>(3)</sup>												



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance								
	(3) As an indication, the emission levels for carbon monoxide are 4 - 50 mg/Nm <sup>3</sup> , as a daily average or average over the sampling period.										
BATc 17	<p>In order to reduce channelled emissions to air of ammonia from the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for the abatement of NOx emissions (ammonia slip), BAT is to optimise the design and/or operation of SCR or SNCR (e.g., optimised reagent to NOx ratio, homogeneous reagent distribution and optimum size of the reagent drops).</p> <p>BAT-associated emission level (BAT-AEL) for channelled emissions to air of ammonia from the use of SCR or SNCR (ammonia slip)</p> <table border="1"> <thead> <tr> <th>Substance / Parameter</th> <th>BAT-AEL (mg/Nm<sup>3</sup>) (Average over the sampling period)</th> </tr> </thead> <tbody> <tr> <td>Ammonia (NH<sub>3</sub>) from SCR/SNCR</td> <td>&lt; 0.5 - 8 <sup>(1)</sup></td> </tr> </tbody> </table> <p>(1) The upper end of the BAT-AEL range may be higher and up to 40 mg/Nm<sup>3</sup> in the case of process off-gases containing very high levels of NOx (e.g., above 5,000 mg/Nm<sup>3</sup>) prior to treatment with SCR or SNCR.</p>	Substance / Parameter	BAT-AEL (mg/Nm <sup>3</sup> ) (Average over the sampling period)	Ammonia (NH <sub>3</sub> ) from SCR/SNCR	< 0.5 - 8 <sup>(1)</sup>	N/A	Not applicable No SCR / SNCR or emissions of ammonia.				
Substance / Parameter	BAT-AEL (mg/Nm <sup>3</sup> ) (Average over the sampling period)										
Ammonia (NH <sub>3</sub> ) from SCR/SNCR	< 0.5 - 8 <sup>(1)</sup>										
BATc 18	<p>In order to reduce channelled emissions to air of inorganic compounds other than channelled emissions to air of ammonia from the use of selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for the abatement of NOx emissions), channelled emissions to air of CO, NOx and SOx from the use of thermal treatment, and channelled emissions to air of NOx from process furnaces/heaters, BAT is to use one or a combination of the techniques given below.</p> <table border="1"> <thead> <tr> <th>Technique</th> <th>Description</th> <th>Main Inorganic Compounds Targeted</th> <th>Applicability</th> </tr> </thead> <tbody> <tr> <td colspan="4">Specific techniques to reduce emissions to air of inorganic compounds</td> </tr> </tbody> </table>	Technique	Description	Main Inorganic Compounds Targeted	Applicability	Specific techniques to reduce emissions to air of inorganic compounds				Yes – to current published UK BAT	<p>Emissions of nitric acid vapour and NOx via the relocated emission point A006 will be abated using a water scrubber i.e. an absorption process in line with BATC18 - Technique a.</p> <p>Emissions of NOx will comply with the current permit emission limit of 200 mg/Nm<sup>3</sup> which aligns with the current best practice emission levels as defined in EA guidance note EPR 4.03.</p> <p>The BAT AEL as defined in the WGC is 150 mg/Nm<sup>3</sup> - however, we note that the WGC BREF has not yet been legally enacted in the</p>
Technique	Description	Main Inorganic Compounds Targeted	Applicability								
Specific techniques to reduce emissions to air of inorganic compounds											



BATc No.	BAT Justification					Operating to BAT	Demonstration of BAT Compliance
	a.	Absorption	Section 1.4.1.	Cl <sub>2</sub> , HCl, HCN, HF, NH <sub>3</sub> , NO <sub>x</sub> , SO <sub>x</sub>	Generally applicable.		<p>UK, and hence consider that compliance with the 200mg/Nm<sup>3</sup> limit is compliant with currently published UK BAT guidance. We also note that currently the emissions via emission point A006 only occur for around 5% of the year.</p> <p>It is proposed that once the unit has been commissioned that actual emissions monitoring data be collated to confirm whether compliance with the BAT-AEL of 150 mg/Nm<sup>3</sup> can be achieved.</p>
	b.	Adsorption	Section 1.4.1. For the removal of inorganic substances, the technique is often used in combination with a dust abatement technique (see BAT 14).	HCl, HF, NH <sub>3</sub> , SO <sub>x</sub>	Generally applicable.		
	c.	Selective catalytic reduction (SCR)	Section 1.4.1.	NO <sub>x</sub>	Applicability to existing plants may be restricted by space availability.		
	D.	Selective non-catalytic reduction (SNCR)	Section 1.4.1.	NO <sub>x</sub>	Applicability to existing plants may be restricted by the residence time needed for the reaction		
	Other techniques not primarily used to reduce emissions to air of inorganic compounds						
	e.	Catalytic oxidation	Section 1.4.1.	NH <sub>3</sub>	Applicability may be restricted by the presence of catalyst poisons in the waste gases.		
	f.	Thermal oxidation	Section 1.4.1.	NH <sub>3</sub> , HCN	Applicability of recuperative and regenerative thermal oxidation to existing plants may be restricted by design and/or operational constraints. The applicability may be restricted where the energy demand is excessive due to the low		



BATc No.	BAT Justification				Operating to BAT	Demonstration of BAT Compliance
				concentration of the compound(s) concerned in the process off-gases.		
BAT-associated emission levels (BAT-AELs) for channelled emissions to air of inorganic compounds						
<b>Substance/Parameter</b>		<b>BAT-AEL (mg-Nm<sup>3</sup>) (Daily average or average over the sampling period)</b>				
Ammonia (NH <sub>3</sub> )		2 - 10 <sup>(1)(2)(3)</sup>				
Elemental chlorine (Cl <sub>2</sub> )		<0.5 - 2 <sup>(4)(5)</sup>				
Gaseous fluorides, expressed as HF		≤ 1 <sup>(4)</sup>				
Hydrogen cyanide (HCN)		< 0.1 – 1 <sup>(4)</sup>				
Gaseous chlorides, expressed as HCl		1-10 <sup>(6)</sup>				
Nitrogen oxides (NO <sub>x</sub> )		10 - 150 <sup>(7)(8)(9)(10)</sup>				
Sulphur oxides (SO <sub>2</sub> )		< 3 - 150 <sup>(11)(9)</sup>				
<p>(1) The BAT-AEL does not apply to channelled emissions to air of ammonia from the use of SCR or SNCR (ammonia slip). This is covered by BAT 17.</p> <p>(2) The BAT-AEL does not apply to minor emissions (i.e., when the NH<sub>3</sub> mass flow is below e.g., 50 g/h).</p> <p>(3) In the case of the drying step in the production of E-PVC, the upper end of the BAT-AEL range may be higher and up to 20 mg/Nm<sup>3</sup>, when the substitution of ammonium salts is not possible due to product quality specifications.</p> <p>(4) The BAT-AEL does not apply to minor emissions (i.e., when the mass flow of the substance concerned is below e.g., 5 g/h).</p> <p>(5) In the case of NO<sub>x</sub> concentrations above 100 mg/Nm<sup>3</sup>, the upper end of the BAT-AEL range may be higher and up to 3 mg/Nm<sup>3</sup> due to analytical interference.</p> <p>(6) The BAT-AEL does not apply to minor emissions (i.e., when the HCl mass flow is below e.g., 30 g/h).</p>						



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>(7) In the case of the production of explosives, the upper end of the BAT-AEL range may be higher and up to 220 mg/Nm<sup>3</sup> when regenerating or recovering nitric acid from the production process.</p> <p>(8) The BAT-AEL does not apply to channelled emissions to air of NO<sub>x</sub> from the use of catalytic or thermal oxidation (see BAT 16) or from process furnaces/heaters (see BAT 36).</p> <p>(9) The BAT-AEL does not apply to minor emissions (i.e., when the mass flow of the substance concerned is below e.g., 500 g/h).</p> <p>(10) In the case of the production of caprolactam, the upper end of the BAT-AEL range may be higher and up to 200 mg/Nm<sup>3</sup> in the case of process off-gases containing very high levels of NO<sub>x</sub> (e.g., above 10 000 mg/Nm<sup>3</sup>) prior to treatment with SCR or SNCR, when the abatement efficiency of the SCR or SNCR is ≥ 99 %.</p> <p>(11) The BAT-AEL does not apply in the case of physical purification or reconcentration of spent sulphuric acid.</p> <p>The associated monitoring is given in BAT 8.</p>		
<b>Diffuse VOC Emissions to Air</b>			
BATc 19	<p>In order to prevent or, where that is not practicable, to reduce diffuse VOC emissions to air, BAT is to elaborate and implement a management system for diffuse VOC emissions, as part of the environmental management system (see BAT 1), that includes all of the following features:</p> <ul style="list-style-type: none"> <li>i. Estimating the annual quantity of diffuse VOC emissions (see BAT 20).</li> <li>ii. Monitoring diffuse VOC emissions from the use of solvents by compiling a solvent mass balance, if applicable (see BAT 21).</li> <li>iii. Establishing and implementing a leak detection and repair (LDAR) programme for fugitive VOC emissions. The LDAR programme typically lasts from 1 to 5 years depending on the nature, scale and complexity of the plant (5 years may correspond to large plants with a high number of emission sources). The LDAR programme includes all of the following features: <ul style="list-style-type: none"> <li>a. Listing of equipment identified as relevant fugitive VOC emission sources in the inventory of diffuse VOC emissions (see BAT 2).</li> <li>b. Definition of criteria associated with the following:</li> </ul> </li> </ul>	N/A	Not applicable – Inorganic chemicals process. No organic compounds present.



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<ul style="list-style-type: none"> <li>• Leaky equipment. Typical criteria could be a leak threshold, above which equipment is considered leaky, and/or the visualisation of a leak with OGI cameras. This depends on the characteristics of the emission source (e.g., accessibility) and the hazardous properties of the emitted substance(s).</li> <li>• Maintenance and/or repair actions to be carried out. A typical criterion could be a VOC concentration threshold triggering the maintenance or repair action (maintenance/repair threshold). The maintenance/repair threshold is generally equal to or higher than the leak threshold. This depends on the characteristics of the emission source (e.g., accessibility) and the hazardous properties of the emitted substance(s). For the first LDAR programme, it is generally not higher than 5,000 ppmv for VOCs other than VOCs classified as CMR 1A or 1B, and 1,000 ppmv for VOCs classified as CMR 1A or 1B. For subsequent LDAR programmes, the maintenance/repair threshold is lowered (see point vi. A.) and not higher than 1,000 ppmv for VOCs other than VOCs classified as CMR 1A or 1B, and 500 ppmv for VOCs classified as CMR 1A or 1B, targeting 100 ppmv.</li> </ul> <p>c. Measuring fugitive VOC emissions from equipment listed under point iii. A. (see BAT 22).</p> <p>d. Carrying out maintenance and/or repair actions (see BAT 23, techniques e. and f.), as soon as possible and where necessary according to the criteria defined in point iii. B. Maintenance and repair actions are prioritised according to the hazardous properties of the emitted substance(s), the significance of the emissions and/or operational constraints. The effectiveness of the maintenance and/or repair actions is verified according to point iii. C., leaving enough time after the intervention (e.g., 2 months).</p> <p>e. Filling in the database mentioned in point v.</p> <p>iv. Establishing and implementing a detection and reduction programme for non-fugitive VOC emissions that includes all of the following features:</p> <ul style="list-style-type: none"> <li>a. Listing of equipment identified as relevant non-fugitive VOC emission sources in the inventory of diffuse VOC emissions (see BAT 2).</li> </ul>		



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>b. Monitoring non-fugitive VOC emissions from equipment listed under point iv. A. (see BAT 22).</p> <p>c. Planning and implementing techniques to reduce non-fugitive VOC emissions (see BAT 23, techniques a., c. and g. to j.). The planning and implementation of the techniques are prioritised according to the hazardous properties of the emitted substance(s), the significance of the emissions and/or operational constraints.</p> <p>d. Filling in the database mentioned in point v.</p> <p>v. Establishing and maintaining a database, for diffuse VOC emissions sources that are identified in the inventory mentioned in BAT 2, for keeping record of:</p> <p>a. equipment design specifications (including the date and description of any design changes);</p> <p>b. the equipment maintenance, repair, upgrade, or replacement actions, performed or planned, and their date of implementation;</p> <p>c. the equipment that could not be maintained, repaired, upgraded or replaced due to operational constraints;</p> <p>d. the results of the measurements or monitoring, including the concentration(s) of the emitted substance(s), the calculated leak rate (as kg/year), the recording from OGI cameras (e.g., from the last LDAR programme) and the date of the measurements or monitoring;</p> <p>e. the annual quantity of diffuse VOC emissions (as fugitive and non-fugitive emissions), including information on non-accessible sources and accessible sources not monitored during the year.</p> <p>vi. Reviewing and updating the LDAR programme periodically. This may include the following:</p> <p>a. lowering the leak and/or maintenance/repair thresholds (see point iii. B.);</p> <p>b. reviewing the prioritisation of equipment to be monitored, giving higher priority to (the type of) equipment identified as leaky during the previous LDAR programme;</p>		



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance									
	<p>c. planning the maintenance, repair, upgrade or replacement of equipment that could not be performed during the previous LDAR programme due to operational constraints.</p> <p>vii. Reviewing and updating the detection and reduction programme for non-fugitive VOC emissions. This may include the following:</p> <p>a. monitoring non-fugitive VOC emissions from equipment where maintenance, repair, upgrade or replacement actions were implemented, in order to determine if those actions were successful;</p> <p>b. planning the maintenance, repair, upgrade or replacement actions that could not be performed due to operational constraints.</p>											
BATc 20	<p>BAT is to estimate fugitive and non-fugitive VOC emissions to air separately at least once every year by using one or a combination of the techniques given below, as well as to determine the uncertainty of this estimation. The estimation distinguishes between VOCs classified as CMR 1A or 1B and VOCs that are not classified as CMR 1A or 1B.</p> <table border="1" data-bbox="313 954 1368 1316"> <thead> <tr> <th data-bbox="313 954 400 991">Technique</th> <th data-bbox="400 954 1126 991">Description</th> <th data-bbox="1126 954 1368 991">Type of Emissions</th> </tr> </thead> <tbody> <tr> <td data-bbox="313 991 400 1027">a.</td> <td data-bbox="400 991 1126 1027">Use of emission factors</td> <td data-bbox="1126 991 1368 1027">See Section 1.4.2</td> </tr> <tr> <td data-bbox="313 1027 400 1316">b.</td> <td data-bbox="400 1027 1126 1316">Use of a mass balance</td> <td data-bbox="1126 1027 1368 1316">Estimation based on the difference in the mass of the substance inputs to and outputs from the plant/production unit, taking into account the generation and destruction of the substance in the plant/production unit. A mass balance may also consist of measuring the concentration of VOCs in the product (e.g., raw material or solvent).</td> </tr> </tbody> </table>	Technique	Description	Type of Emissions	a.	Use of emission factors	See Section 1.4.2	b.	Use of a mass balance	Estimation based on the difference in the mass of the substance inputs to and outputs from the plant/production unit, taking into account the generation and destruction of the substance in the plant/production unit. A mass balance may also consist of measuring the concentration of VOCs in the product (e.g., raw material or solvent).	N/A	Not applicable – Inorganic chemicals process. No organic compounds present.
Technique	Description	Type of Emissions										
a.	Use of emission factors	See Section 1.4.2										
b.	Use of a mass balance	Estimation based on the difference in the mass of the substance inputs to and outputs from the plant/production unit, taking into account the generation and destruction of the substance in the plant/production unit. A mass balance may also consist of measuring the concentration of VOCs in the product (e.g., raw material or solvent).										



BATc No.	BAT Justification			Operating to BAT	Demonstration of BAT Compliance	
	c.	Use of thermodynamic models	Estimation using the laws of thermodynamics applied to equipment (e.g., tanks) or particular steps of a production process. The following data are generally used as input for the model: <ul style="list-style-type: none"> <li>chemical properties of the substance (e.g., vapour pressure, molecular mass);</li> <li>process operating data (e.g., operating time, product quantity, ventilation);</li> <li>characteristics of the emission source (e.g., tank diameter, colour, shape).</li> </ul>	Fugitive and/or non-fugitive		
BATc 21	BAT is to monitor diffuse VOC emissions from the use of solvents 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 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.			N/A	Not applicable – Inorganic chemicals process. No organic compounds present.	
		Techniques	Description			
a.	Full identification and quantification of the relevant solvent inputs and outputs, including the associated uncertainty		This includes: <ul style="list-style-type: none"> <li>identification and documentation of solvent inputs and outputs (e.g., channelled and diffuse emissions to air, emissions to water, solvent output in waste);</li> <li>substantiated quantification of each relevant solvent input and output and recording of the methodology used (e.g.,</li> </ul>			



BATc No.	BAT Justification			Operating to BAT	Demonstration of BAT Compliance
			measurement, estimation by using emission factors, estimation based on operational parameters); <ul style="list-style-type: none"> <li>• identification of the main sources of uncertainty of the aforementioned quantification, and implementation of corrective actions to reduce the uncertainty; and</li> <li>• regular update of solvent input and output data.</li> </ul>		
	b.	Implementation of a solvent tracking system	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).		
	c.	Monitoring of changes that may influence the uncertainty of the solvent mass balance data	Any change that could influence the uncertainty of the solvent mass balance data is recorded, such as: <ul style="list-style-type: none"> <li>• malfunctions of the waste gas treatment system: the date and period of time are recorded; and</li> <li>• changes that may influence air/gas flow rates (e.g., replacement of fans): the date and type of change are recorded.</li> </ul>		
BATc 22	BAT is to monitor diffuse VOC emissions to air 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.			N/A	Not applicable – Inorganic chemicals process. No organic compounds present.



BATc No.	BAT Justification				Operating to BAT	Demonstration of BAT Compliance	
	Type of Sources of Diffuse VOC Emissions <sup>(1)(2)</sup>	Type of VOCs	Standard(s)	Minimum Monitoring Frequency			
	Sources of fugitive emissions	VOCs classified as CMR 1A or 1B	EN 15446 <sup>(8)</sup>	Once every year <sup>(3)(4)(5)</sup>			
		VOCs not classified as CMR 1A or 1B		Once during the period covered by each LDAR programme (see BAT 19 point iii.) <sup>(6)</sup>			
	Sources of non-fugitive emissions	VOCs classified as CMR 1A or 1B	EN 17628	Once every year			
		VOCs not classified as CMR 1A or 1B		Once every year <sup>(7)</sup>			
	<p>(1) The monitoring only applies to emission sources that are identified as relevant in the inventory given in BAT 2.</p> <p>(2) The monitoring does not apply to equipment operated under sub atmospheric pressure.</p> <p>(3) In the case of inaccessible sources of fugitive VOC emissions (e.g., if the monitoring requires the removal of insulation or the use of scaffolding), the monitoring frequency may be reduced to once during the period covered by each LDAR programme (see BAT 19 point iii.).</p> <p>(4) For the production of PVC, the minimum monitoring frequency may be reduced to once every 5 years if the plant uses VCM gas detectors to continuously monitor VCM emissions in a way that allows an equivalent level of detection of VCM leaks.</p> <p>(5) In the case of high-integrity equipment (see BAT 23 b.) in contact with VOCs classified as CMR 1A or 1B, a lower minimum monitoring frequency may be adopted, but in any case, at least once every 5 years.</p> <p>(6) In the case of high-integrity equipment (see BAT 23 b.) in contact with VOCs other than VOCs classified as CMR 1A or 1B, a lower minimum monitoring frequency may be adopted, but in any case, at least once every 8 years.</p> <p>(7) The minimum monitoring frequency may be reduced to once every 5 years if non-fugitive emissions are quantified by using measurements.</p> <p>(8) This standard may be completed by EN 17628.</p> <p>Note: Optical gas imaging (OGI) is a useful complementary technique to the method EN 15446 ('sniffing') in order to identify sources of fugitive VOC emissions and is particularly relevant in the case of inaccessible sources (see Section 1.4.2.) This technique is described in EN 17628.</p>						



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance																		
	<p>In the case of non-fugitive emissions, measurements may be complemented by the use of thermodynamic models. Where large amounts (e.g., above 80 t/yr) of VOCs are used/consumed, the quantification of VOC emissions from the plant with tracer correlation (TC) or with optical absorption-based techniques, such as differential absorption light detection and ranging (DIAL) or solar occultation flux (SOF), is a useful complementary technique (see Section 1.4.2).</p>																				
BATc 23	<p>In order to prevent or, where that is not practicable, to reduce diffuse VOC emissions to air, BAT is to use a combination of the techniques given below with the following order of priority.</p> <p>Note: The use of techniques to prevent or, where that is not practicable, to reduce diffuse VOC emissions to air is prioritised according to the hazardous properties of the emitted substance(s) and/or the significance of the emissions.</p> <table border="1" data-bbox="315 751 1368 1343"> <thead> <tr> <th data-bbox="315 751 580 810">Technique</th> <th data-bbox="580 751 987 810">Description</th> <th data-bbox="987 751 1149 810">Type of Emissions</th> <th data-bbox="1149 751 1368 810">Applicability</th> </tr> </thead> <tbody> <tr> <td colspan="4" data-bbox="315 810 1368 847"><b>1. Prevention techniques</b></td> </tr> <tr> <td data-bbox="315 847 383 1102">a.</td> <td data-bbox="383 847 580 1102">Limiting the number of emission sources</td> <td data-bbox="580 847 987 1102">                     This includes:                     <ul style="list-style-type: none"> <li>• minimising pipe lengths;</li> <li>• reducing the number of pipe connectors (e.g., flanges) and valves;</li> <li>• using welded fittings and connections;</li> <li>• using compressed air or gravity for material transfer.</li> </ul> </td> <td data-bbox="987 847 1149 1102">Fugitive and non-fugitive emissions</td> <td data-bbox="1149 847 1368 1102">Applicability may be restricted by operational constraints in the case of existing plants.</td> </tr> <tr> <td data-bbox="315 1102 383 1343">b.</td> <td data-bbox="383 1102 580 1343">Use of high integrity equipment</td> <td data-bbox="580 1102 987 1343">                     High-integrity equipment includes, but is not limited to:                     <ul style="list-style-type: none"> <li>• bellows valves or double packing seals or equally effective equipment;</li> <li>• magnetically driven or canned pumps/compressors/agitators</li> </ul> </td> <td data-bbox="987 1102 1149 1343">Fugitive emissions</td> <td data-bbox="1149 1102 1368 1343">Applicability may be restricted by operational constraints in the case of existing plants. Generally applicable to new plants and major plant upgrades.</td> </tr> </tbody> </table>	Technique	Description	Type of Emissions	Applicability	<b>1. Prevention techniques</b>				a.	Limiting the number of emission sources	This includes: <ul style="list-style-type: none"> <li>• minimising pipe lengths;</li> <li>• reducing the number of pipe connectors (e.g., flanges) and valves;</li> <li>• using welded fittings and connections;</li> <li>• using compressed air or gravity for material transfer.</li> </ul>	Fugitive and non-fugitive emissions	Applicability may be restricted by operational constraints in the case of existing plants.	b.	Use of high integrity equipment	High-integrity equipment includes, but is not limited to: <ul style="list-style-type: none"> <li>• bellows valves or double packing seals or equally effective equipment;</li> <li>• magnetically driven or canned pumps/compressors/agitators</li> </ul>	Fugitive emissions	Applicability may be restricted by operational constraints in the case of existing plants. Generally applicable to new plants and major plant upgrades.	N/A	Not applicable – Inorganic chemicals process. No organic compounds present.
Technique	Description	Type of Emissions	Applicability																		
<b>1. Prevention techniques</b>																					
a.	Limiting the number of emission sources	This includes: <ul style="list-style-type: none"> <li>• minimising pipe lengths;</li> <li>• reducing the number of pipe connectors (e.g., flanges) and valves;</li> <li>• using welded fittings and connections;</li> <li>• using compressed air or gravity for material transfer.</li> </ul>	Fugitive and non-fugitive emissions	Applicability may be restricted by operational constraints in the case of existing plants.																	
b.	Use of high integrity equipment	High-integrity equipment includes, but is not limited to: <ul style="list-style-type: none"> <li>• bellows valves or double packing seals or equally effective equipment;</li> <li>• magnetically driven or canned pumps/compressors/agitators</li> </ul>	Fugitive emissions	Applicability may be restricted by operational constraints in the case of existing plants. Generally applicable to new plants and major plant upgrades.																	



BATc No.	BAT Justification					Operating to BAT	Demonstration of BAT Compliance
			<p>rs, or pumps/compressors/agitators using double seals and a liquid barrier;</p> <ul style="list-style-type: none"> <li>certified high-quality gaskets (e.g., according to EN 13555) that are tightened according to technique e.; and</li> <li>closed sampling system.</li> </ul> <p>The use of high-integrity equipment is especially relevant to prevent or minimise:</p> <ul style="list-style-type: none"> <li>emissions of CMR substances or substances with acute toxicity; and/or</li> <li>emissions from equipment with high-leaking potential; and/or</li> <li>leaks from processes operated at high pressures (e.g., between 300 bar and 2 000 bar).</li> </ul> <p>High-integrity equipment is selected, installed, and maintained according to the type of process and the process operating conditions.</p>				
	c.	Collecting diffuse emissions and treating off-gases	Collecting diffuse VOC emissions (e.g., from compressor seals, vents and purge lines) and sending them to recovery (see BAT 9 and BAT 10) and/or abatement (see BAT 11).	Fugitive and non-fugitive emissions	Applicability may be restricted: <ul style="list-style-type: none"> <li>for existing plants; and/or</li> <li>by safety concerns (e.g., avoiding</li> </ul>		



BATc No.	BAT Justification				Operating to BAT	Demonstration of BAT Compliance
				concentrations close to the lower explosive limit).		
	<b>2. other techniques</b>					
d.	Facilitating access and/or monitoring activities	To ease maintenance and/or monitoring the access to potentially leaky equipment is facilitated, e.g., by activities, installing platforms, and/or drones are used for monitoring.	Fugitive emissions x	Applicability may be restricted by operational constraints in the case of existing plants.		
e.	Tightening	This includes: <ul style="list-style-type: none"> <li>tightening of gaskets by personnel that is qualified according to EN 1591-4x and using the designed gasket stress (e.g., calculated according to EN 1591-1);</li> <li>installing tight caps on open ends; and</li> <li>using flanges selected assembled according to EN 13555.</li> </ul>	Fugitive emissions	Generally applicable.		
f.	Replacement of leaky equipment and/or parts	This includes the replacement of: <ul style="list-style-type: none"> <li>gaskets;</li> <li>sealing elements (e.g., tank lid); and</li> <li>packing material (e.g., valve stem packing material).</li> </ul>	Fugitive emissions	Generally applicable.		
g.	Reviewing and updating process design	This includes: <ul style="list-style-type: none"> <li>reducing the use of solvents and/or using solvents with lower volatility;</li> </ul>	Non-fugitive emissions	Applicability may be restricted in the case of existing plants due to operational constraints.		



BATc No.	BAT Justification				Operating to BAT	Demonstration of BAT Compliance	
			<ul style="list-style-type: none"> <li>reducing the formation of side products containing VOCs;</li> <li>lowering the operating temperature; and</li> <li>lowering the VOC content in the final product.</li> </ul>				
	h.	Reviewing and updating operating conditions	This includes: <ul style="list-style-type: none"> <li>reducing the frequency and duration of reactor and vessel openings; and</li> <li>preventing corrosion by lining or coating of equipment, by painting pipes (for external corrosion) and by using corrosion inhibitors for materials in contact with equipment.</li> </ul>	Non-fugitive emissions	Generally applicable. x		
	i.	Using closed systems	This includes: <ul style="list-style-type: none"> <li>vapour balancing (see Section 1.4.3);</li> <li>closed systems for solid/liquid and liquid/liquid phase separations;</li> <li>closed systems for cleaning operations;</li> <li>closed sewers and/or wastewater treatment plants;</li> <li>closed sampling systems;</li> <li>closed storage areas; and</li> <li>Off-gases from closed systems are sent to recovery (see BAT 9 and BAT 10)</li> </ul>	Non-fugitive emissions	Applicability may be restricted by operational constraints in the case of existing plants and/or by safety concerns.		



BATc No.	BAT Justification				Operating to BAT	Demonstration of BAT Compliance
	j.	Using techniques to minimise emissions from surfaces	This includes: <ul style="list-style-type: none"> <li>installing oil creaming systems on open surfaces;</li> <li>periodically skimming open surfaces (e.g., removing floating matter);</li> <li>installing anti-evaporation floating elements on open surfaces;</li> <li>treating wastewater streams to remove VOCs and send the VOCs to recovery (see BAT 9 and BAT 10) and/or abatement (see BAT 11);</li> <li>installing floating roofs on tanks; and</li> <li>using fixed-roof tanks connected to a waste gas treatment.</li> </ul>	Non-fugitive emissions	Applicability may be restricted by operational constraints in the case of existing plants.	
and/or abatement (see BAT 11).						
BAT conclusions for the use of solvents or the reuse of recovered solvents The emission levels for the use of solvents or the reuse of recovered solvents given below are associated with the general BAT conclusions given in Section 1.1 and Section 1.1.4.3. BAT-associated emission level (BAT-AEL) for diffuse VOC emissions to air from the use of solvents or the reuse of recovered solvents						
<b>Parameter</b>			<b>BAT-AEL (percentage of the solvent inputs) (Yearly Average) (¹)</b>			
Diffuse VOC Emissions			≤ 5%			



BATc No.	BAT Justification	Operating to BAT	Demonstration of BAT Compliance
	<p>(1) The BAT-AEL does not apply to plants whose annual consumption of solvents is lower than 50 tonnes.</p> <p>The associated monitoring is given in BAT 20, BAT 21 and BAT 22.</p>		



