Review File under IED Directive - Executive summary

Chalampé (67- France) Site

Prepared for: BUTACHIMIE

Project No. 60567877

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Chalampé (67- France) Site

Report

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Reference Sheet

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GLOSSARY

ADN	Adiponitrile
AEL	Associated Emission Levels
BAT	Best Available Technique
BREF	*Best REFerence* (Reference document relative to Best Available Techniques)
CWW	Complementary BREF relative to Common wastewater and waste gas treatment/management systems in the chemical sector
EFS	Transversal BREF relative to Emissions from storage of hazardous or bulk materials
ELV	Emission Limit Value
ENE	Transversal BREF relative to Energy efficiency
HCl	Hydrogen chloride
HCN	Hydrocyanic acid
HF	Hydrofluoric acid
HMD	Hexamethylene diamine
ICS	Transversal BREF relative to Industrial cooling systems
IED	Industrial Emissions Directive
LCP	BREF relative to Large combustion plants
LVOC	BREF relative to the production of large volume organic chemicals
NGT	Natural Gas Treatment
PCDD/F	Dioxins and furans
WI	BREF relative to waste incineration

1. EXECUTIVE SUMMARY

1.1 Context

BUTACHIMIE produces intermediate chemical products mainly aimed at the manufacturing of nylon 6-6 at their site located in the industrial complex of the town of Chalampé, in the Alsace region.

The production line is divided into two parts:

- Workshop AD4, regrouping units HCN (hydrocyanic acid synthesis) and ADN (adiponitrile synthesis);
- Workshop Nord 3, composed of unit HMD, where the synthesis of hexamethylene diamine is performed.

Activities at this site are subject to European Directive No. 2010/75/UE relative to industrial emissions, also called IED Directive, under 4 rubrics of the French regulation relative to classified installations for the protection of the environment (*Installations Classées pour la Protection de l'Environnement* – ICPE):

- 3110 – Large combustion installations;
- 3410-d – Production of organic chemicals in industrial quantities by chemical or biological transformation;
- 3420-a - Production of inorganic chemicals in industrial quantities by chemical or biological transformation;
- 3520-b – Disposal or valorisation of hazardous wastes in waste incineration installations or waste co-incineration installations.

The conclusions relative to Best Available Techniques (BAT) in the sector of the production of large volume of organic chemicals were adopted by the European Commission (Implementing Decision (EU) No. 2017/2117 dated 21 November 2017) and published in the Official Journal of the European Union on 7 December 2017.

As rubric 3410 was declared as the facility's main IED rubric, BUTACHIMIE must transmit to the Administration a review file whose objective is to compare the site's operation with the techniques and emission levels (BAT-AELs) described in the conclusions relative to the best available techniques.

Following this review, it will be possible to update the authorisation conditions.

1.2 Description of the installations

The Chalampé complex, where the BUTACHIMIE installations are situated, is located in the Haut-Rhin department, 17 km from the city of Mulhouse and less than 1 km from the German border.

It is located on the western side of the Grand Canal d'Alsace and at an important junction of river, rail and road routes.

Figure 1: Location of the Chalampé complex
(IGN map 1/25000 RIXHEIM No. 3720 Est)

The Chalampé complex is occupied by two companies:

- RHODIA OPERATIONS (wholly-owned subsidiary of SOLVAY);
- BUTACHIMIE (50% SOLVAY and 50% INVISTA).

The vocation of both companies is the production of intermediate products mainly destined to the manufacturing of nylon 6.6.

The BUTACHIMIE facility is mostly located in the south-western part of the complex and covers more than 23 hectares, including 2.5 ha occupied by unit HMD located to the north of the complex.

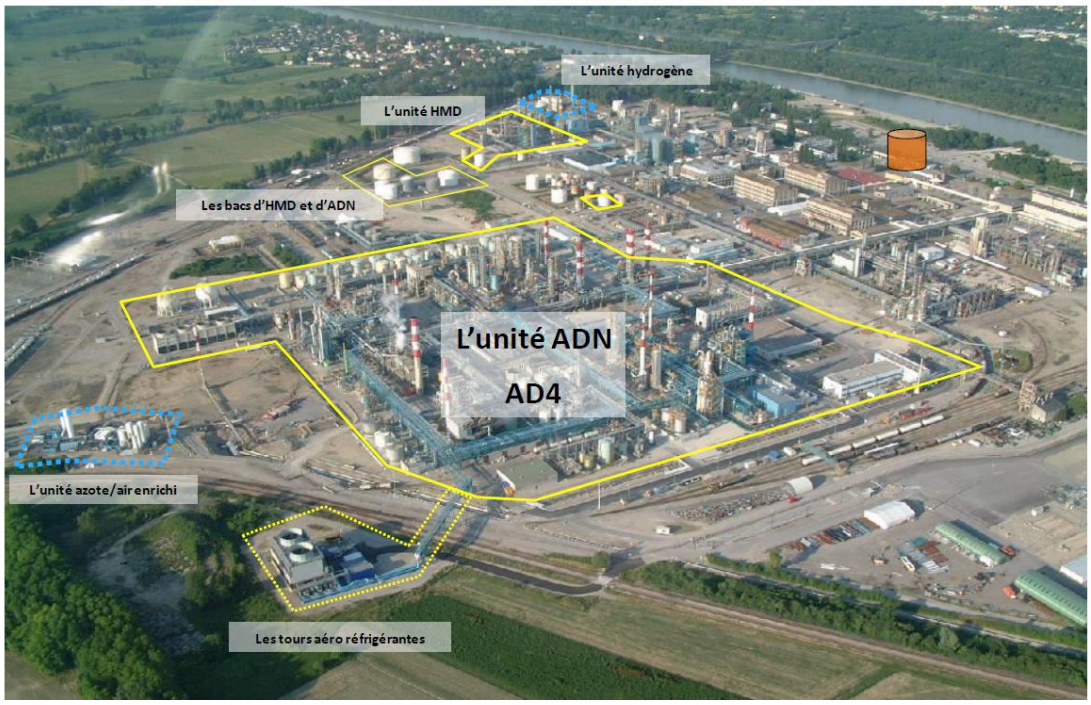

Figure 2: Location of BUTACHIMIE installations at the Chalampé complex

The following diagram summarily presents the production lines present at the complex. The scope of the review file only concerns the installations exploited by BUTACHIMIE, meaning workshop AD4 (unit HCN+ unit ADN) and unit HMD.

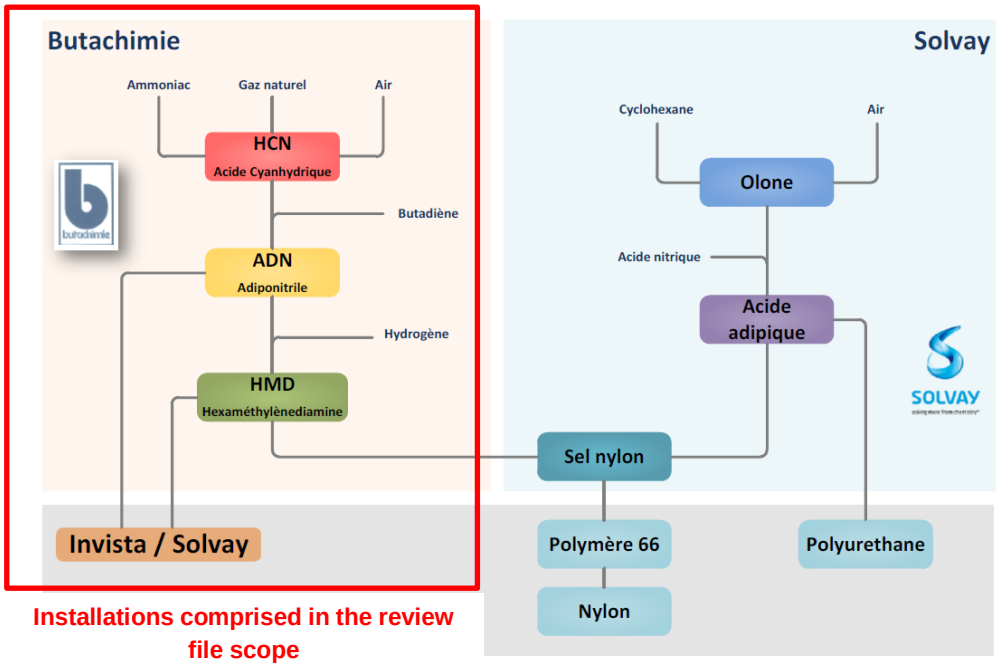

Figure 3: Production diagram of the complex

Unit HCN

Hydrocyanic acid (HCN) is synthesised by the chemical reaction between gaseous ammoniac (NH_3) and methane (CH_4) present in natural gas.

Natural gas used for this synthesis is supplied by natural gas pipeline. Ammoniac is delivered by a supply line from neighbouring company BOREALIS who receives ammoniac from barges or trains.

The hydrocyanic acid (HCN) production workshops comprise the following sections:

- Natural gas treatment (NGT) ;
- Preparation of reagents and pre-heating;
- Synthesis of hydrocyanic acid;
- Recovery of excess ammoniac;
- Absorption and purification of hydrocyanic acid;
- Treatment of unit HCN's effluents: disposal of ammoniac and cyanides present in the effluents.

The hydrocyanic acid produced in this unit is used as raw material at unit ADN.

Unit ADN

Adiponitrile (ADN) is produced by the addition of 2 hydrocyanic acid (HCN) molecules on a butadiene molecule.

Hydrocyanic acid comes from unit HCN. Butadiene is delivered by rail tank cars or barges, and it is stored in 2 spheres.

The adiponitrile (ADN) production workshop comprise the following sections:

- Synthesis;
- Distillation (extraction, separation, purification);
- Mixed unit (additional synthesis and distillation element);
- Tank-farm: storage area with approximately thirty tanks for the storage of intermediate products generated by the units;
- Effluent treatment: aqueous and organic effluents from the unit are incinerated in a combustion furnace operated by BUTACHIMIE.

The produced ADN is mostly consumed in the HMD production unit.

Unit HMD

The HMD production unit is mainly composed of two large blocks:

- The reaction to obtain raw HMD: hydrogenation of adiponitrile (ADN) in a pressurised hydrogen reactor in presence of a nickel-based catalyser;

- Distillation to purify the HMD.

The contaminated water likely to contain nickel is directed toward an effluent treatment enabling to recover residual nickel.

It is to be noted that this unit is exploited by BUTACHIMIE but it is operated by SOLVAY.

Ancillary installations and utilities

For the operation of its installations, BUTACHIMIE has boilers which mainly use residual gases from unit HCN as combustible, flares enabling to ensure safety and cooling installations (notably one cooling tower).

Main utilities implemented at the site comprise power, vapour, industrial water and drinking water.

1.3 Reference documents (BREF)

Best available techniques reference documents (or BREFs) are documents describing the implemented techniques, emissions and consumption levels at the time of the definition of the BAT.

The main rubric associated with the BUTACHIMIE activities in Chalampé is rubric **3410: Fabrication of organic chemicals in industrial quantities by chemical or biological transformation.**

This rubric partly comes under the conclusions of the BREF relative to the production of large volume organic chemicals, or BREF LVOC.

The BREF LVOC conclusions also mention, in their scope, other reference documents likely to present an interest for these activities. Given the site activities, the following BREFs are also relevant:

- **CWW**: Common wastewater and waste gas treatment/management systems in the chemical sector (conclusions published in May 2016);
- **EFS**: Emissions from storage of hazardous or bulk materials (July 2006);
- **ENE**: Energy efficiency (February 2009);
- **ICS**: Industrial cooling systems (December 2001);
- **LCP**: Large combustion plants (conclusions published in 2017);
- **WI**: Waste incineration (August 2006).

The position of the installations relatively to these different BREFs was therefore assessed in the reviews file such as planned by article R. 515-70 of the Environment Code.

1.4 Comparison with Best Available Techniques (BAT)

1.4.1 *BREF LVOC*

The BREF LVOC scope concerns the production of organic chemicals.

All the installations operated by BUTACHIMIE come within the scope of this BREF and notably the industrial furnaces present at the units. However, the incinerator and boilers are excluded from the BREF LVOC scope and come under the BREF WI and BREF LCP scopes, respectively.

The summary of the comparison of the BUTACHIMIE installations' operation with the BAT from this BREF is presented in the following paragraphs.

Concerning the prevention of air pollution, for combustion installations (industrial furnaces), the use of gas combustibles (mainly residual gases and natural gas as backing) and the automatic regulation of combustion parameters enabling the optimisation of the combustion reaction are considered as BATs.

For the other sources of air emissions, compliance with BATs are ensured by the recovery and use of organic solvents and organic raw materials which have not reacted, the implementation of techniques aiming to reduce the entrainment of solids or liquids, or the implementation of techniques enabling the reduction of channelled VOC emissions.

Concerning the monitoring of discharges, the monitoring frequency of Volatile Organic Compounds (VOCs) is going to be adapted by BUTACHIMIE on some outlets.

It is to be noted that no emission limit value relative to air discharges is set by the BREF LVOC for the activities conducted by BUTACHIMIE.

Concerning the protection of water resources and aquatic environment, BREF LVOC does not directly discuss this issue but it refers to BREF CWW – Common wastewater and waste gas treatment/management systems in the chemical sector which takes discharges into account. The position of the installations relatively to this BREF is discussed in more detail hereafter.

Concerning the efficient use of resources and the management of wastes, the techniques listed in the BAT are implemented by BUTACHIMIE.

As such, subject to some evolutions presented in section 1.5, the BUTACHIMIE installations respect the requirements of the BREF LVOC's BATs applicable and relevant to its process.

1.4.2 *BREF LCP*

The BREF LCP scope concerns the combustion of combustibles in installations with a total rated thermal power equal to or above 50 MW. **Only the two boilers supplied with the waste gas from the process for the production of vapour necessary to site activities come under the scope of this BREF.**

The summary of the comparison of the BUTACHIMIE installations' operation with the BAT from this BREF is presented in the following paragraphs.

Concerning the operation of the installations, the boilers are mainly supplied with waste gas from unit HCN and natural gas for combustibles. As natural gas is a standardised product, no characterisation of this combustible is necessary. Concerning waste gases, the relevant

parameters are monitored on a weekly basis by the analysis of a limited sample. The combustion parameters are automatically adapted by regulation based on the net calorific value, which is in compliance with the BAT.

Periods where operation conditions are other than the normal operation periods are mainly the start-up and shut-down phases. In accordance with the BAT, BUTACHIMIE has a management plan relative to these periods, enabling the limitation of emissions during these periods.

Concerning the prevention of air pollution, the use of waste gases from unit HCN and the use of natural gas as a complement (gaseous combustibles) are considered as BATs to optimise the reduction of air pollutant emissions. The boilers' gas discharges respect the range of emission values set by the BREF for sulphur dioxide, dust and volatile organic compounds. For nitrogen oxides, it appears that the discharge value is sometimes exceeded during some operating modes. However, measured values do not correspond to the best achievable performances concerning NOx emissions. It will be possible for BUTACHIMIE to adapt some process parameters, including upstream of the boilers in order to decrease nitrogen concentrations in waste gases and therefore respect the BAT-AEL range.

In addition, the monitoring of the boilers' air discharges will have to be adapted for hydrogen chloride, hydrofluoric acid and dioxins.

Concerning the protection of water resources and aquatic environment, as the boilers do not consume water for the combustion processes and as they don't need to have smoke treatment systems, they are not concerned by the BATs relative to water consumption and the reduction of water discharges.

Concerning the reduction of noise emissions, one of the boilers was identified as a predominant noise source and must be subject to hush kitting.

Concerning energy efficiency, BUTACHIMIE implements the techniques listed in the BAT. The boilers' energy efficiency levels are comprised in the range of reference values defined by the BREF.

As such, subject to some evolutions presented in section 1.5, the BUTACHIMIE installations respect the requirements of the BREF LCP's BATs applicable and relevant to its process.

1.4.3 *BREF CWW*

The BREF CWW scope concerns the chemical sector and the treatment of associated wastewater in autonomous installations. This BREF is indicated as "likely to present an interest for the activities mentioned" in BREF LVOC and LCP.

Therefore, all the site activities come within the scope of this BREF.

The summary of the comparison of the BUTACHIMIE installations' operation with the BAT from this BREF is presented in the following paragraphs.

BUTACHIMIE and SOLVAY are certified ISO 14 001 since 25 March 2015 thus respecting the requirement for the implementation of an environmental management system.

Concerning the prevention of air pollution, the BAT consists in confining the gas emission sources and treating the emissions as much as possible. As such, the tanks containing

volatile products present in the tank farm have a nitrogen blanket and emissions associated with the movements of tanks are collected by an absorption tower. In addition, waste gases from unit HCN are recovered and used as combustibles in the site's combustion installations (boilers and furnaces). At the level of unit HMD, the distillation steps are performed at reduced pressure, thus limiting emissions to the air. These practices are in compliance with the BATs.

Some effluents are currently collected and sent to the flares, notably a cut containing a mix of butylene and butadiene. In order to respect the BAT, a reflexion is underway for the energy recycling of this cut as combustible in a combustion installation.

Finally, the measures limiting fugitive VOC emissions (design and operation technique) as well as the implemented monitoring method are in compliance with the BATs defined in the BREF.

Concerning the protection of water resources and aquatic environment, BUTACHIMIE implements different techniques and measures to reduce the volume and/or contaminating charge of water effluents in accordance with the BAT. Complementary measures are being assessed.

The water discharges of BUTACHIMIE will respect in 2021, the range of emission values set by the BREF and applicable, except for copper at discharge point 9997. **In this context, BUTACHIMIE requests a temporary derogation to the range of emission values applicable at discharge point 9997 for copper.**

Furthermore, the monitoring of water discharges will have to be adapted for total phosphorus and halogenated organic compounds (AOX) at discharge point 1451. An ecotoxicity measurement will also be implemented at discharge point 9997.

Concerning waste management, the techniques specific to sludge listed in the BAT aiming to reduce their volume are implemented by BUTACHIMIE when relevant and applicable.

Concerning the reduction of noise emissions, the techniques listed in the BAT are implemented to the extent of the technical constraints and their relevance relatively to the installation. In addition, noise emissions are therefore subject to a monitored management.

As such, subject to some evolutions summarised in section 1.5, the BUTACHIMIE installations respect the requirements of the BREF CWW's BATs applicable and relevant to its process.

1.4.4 *BREF WI, EFS, ENE and ICS*

To date, the conclusions relative to the BATs of these BREFs have not been published by the European Commission. Are available only the BREF versions dating from 2001 to 2009 depending on the considered BREF. In these versions, it is reminded that there are no regulatory emission levels associated with these BREFs.

A comparison of the operation of the BUTACHIMIE site's installations coming under the scopes of these BREFs was however performed with the best techniques described in these documents.

Concerning BREF WI, the main evolution planned by BUTACHIMIE concerns the reduction of NOx emissions through the implementation of continuous improvement actions relative to the management of the burners and their associated atomising system.

Concerning BREF EFS, only one evolution is planned: for new tank projects and renovation projects for volatile product storage tanks, BUTACHIMIE will apply a tank colour with a heat or light radiation reflexivity of at least 70%. This requirement will be integrated in the projects' specifications.

Concerning BREFs ENE and ICS, the comparison shows that the installations are in compliance and that no site evolution is necessary to respond to the BATs of these different BREFs.

1.5 Summary of evolutions planned following the comparison with BATs

It emerges from the comparative analysis of the operation of installations that in their majority, the techniques implemented at the site are in compliance with the BATs.

For some aspects, however, some evolutions are necessary to respond to the BATs. Key evolutions planned at the site are summarised in the following table:

Concerned BAT	Planned evolutions
BREF LVOC	
BAT 2	Feasibility study relative to the installation of an on-line analyser on the tank farm's VOC absorption tower.
	Implementation of monthly measurement of total VOC parameter at the outlet of the vacuum pump for a 1-year period. Following this period, if results are stable, BUTACHIMIE will propose a more adapted measurement frequency.
	Study relative to the installation of sampling points on the fire valve of unit HMD to enable the collection of samples
	Implementation of monthly VOC measurement over a 3-month period on the fire valve of unit HMD. Following this period, the measurement frequency will be adjusted depending on the results.
BAT 18	Definition and validation of equipment important for the environment at unit HMD.
LCP	
BAT 4	Implementation of yearly monitoring of HCl, HF and PCDD/F parameters at the outlet of chimneys of CNIM and BABCOCK boilers for a 3-year period. Following this period, the measurement frequency for these parameters will be adapted depending on the results.
BAT 17	Hush kitting of CNIM boiler identified as a predominant noise source during the noise sources mapping effort in 2016.
BAT 56	Adaptation of AND-HCN process parameters, including upstream of boilers, to reduce the nitrogen concentration in waste gases and respect the applicable BAT-AEL range defined based on the calculation formula in article 40.1 of directive 2010/75/UE.
CWW	
BAT 2	Implementation of the inventory of water and gas effluent flows respecting the requirements of the BAT for unit HMD.
BAT 4	Implementation of daily measurement of total phosphorus at discharge point 1451 for a 1-year period. Following this period, depending on the results, it will be possible to propose a more adapted frequency.

Concerned BAT	Planned evolutions
	Implementation of quarterly measurement of ecotoxicity parameter at discharge point 9997.
	Implementation of quarterly measurement of AOX parameter at discharge point 1451.
BAT 17	Energy recycling of the purge of cut C4 (currently directed to the flare) as combustible
Paragraph 3.4 of conclusions	Preparation of a temporary derogation request file relative to the copper parameter at discharge point 9997.
WI	
/	Reduction of NOx emissions through the implementation of continuous improvement actions for the management of the burners and their associated atomising system.
EFS	
/	Concerning new tank projects and renovation projects relative to the volatile product storage tanks, BUTACHIMIE will apply a tank colour with a heat or light radiation reflexivity of at least 70%. This requirement will be integrated to the projects' specifications.

Table 1: Planned evolution at the BUTACHIMIE site following the review of the different BREFs

No evolution of the installations operated by BUTACHIMIE is necessary to respect the BATs of BREFs ENE and ICS. It should be noted that BUTACHIMIE energy system is managed under ISO 50 001.

Furthermore, a comparison of discharges from the BUTACHIMIE installations to the applicable BAT-AELs was performed.

BUTACHIMIE requests a temporary derogation to the applicable BAT-AEL at water effluent discharge point 9997 for the copper parameter (BREF CWW). The temporary derogation request file is enclosed with the review file.

Finally, no review of the operating permit's prescriptions relatively to the criteria defined in article R. 515-72 of the Environment Code appears to be necessary.

LIMITATIONS

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