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Seville, 29<sup>th</sup> October 2019

**KICK-OFF MEETING**  
**FOR THE REVIEW OF THE**  
**BEST AVAILABLE TECHNIQUES (BAT)**  
**REFERENCE DOCUMENT FOR**  
**THE SMITHERIES AND FOUNDRIES (SF) INDUSTRY**  
**SEVILLE, 17 – 20 September 2019**  
**MEETING REPORT**

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## Acronyms used in this Report

### General acronyms – Definitions

Acronym	Meaning
AOX	Adsorbable organically bound halogens
BAT	Best Available Techniques (as defined in Article 3(10) of the IED)
BAT-AEL	Emission level associated with the BAT (as defined in Article 3(13) of the IED)
BAT-AEPL	BAT-associated environmental performance level (as described in Section 3.3 of Commission Implementing Decision 2012/119/EU). BAT-AEPLs include BAT-AELs.
BATIS	BAT Information System
B[a]P	Benzo[a]pyrene
BP	Background Paper
BREF	BAT reference document (as defined in Article 3(11) of the IED)
BREF Guidance	Commission Implementing Decision 2012/119/EU
BTEX	Benzene, toluene, ethylbenzene and xylene
CMR	Carcinogenic, mutagenic or toxic for reproduction
COD	Chemical oxygen demand
DMIPA	<i>N,N</i> -Dimethylisopropylamine
ECHA	European Chemicals Agency
EFS BREF	BAT reference document on Emissions from Storage
EIPPCB	European IPPC Bureau
ELV	Emission limit value
EN	European Standard adopted by CEN (European Committee for Standardisation, from its French name Comité Européen de Normalisation)
E-PRTR	European Pollutant Release and Transfer Register
ESP	Electrostatic precipitator
EU	European Union
HOI	Hydrocarbon oil index. The sum of compounds extractable with a hydrocarbon solvent (including long-chain or branched aliphatic, alicyclic, aromatic or alkyl-substituted aromatic hydrocarbons).
ICS BREF	BAT reference document on Industrial Cooling Systems
IED	Industrial Emissions Directive (2010/75/EU)
IPs	Initial positions
IPPC	Integrated Pollution Prevention and Control
IS BREF	BAT reference document for Iron and Steel Production
KEI	Key environmental issue
KoM	Kick-off Meeting
MS	Member State
NFM BREF	BAT reference document for the Non-Ferrous Metals Industries
NGO	Non-governmental organisation
NMP	<i>N</i> -methyl-2-pyrrolidone
NMVO	Non-methane volatile organic compound(s)
OTNOC	Other than normal operating conditions
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PCDD/Fs	Polychlorinated dibenzo- <i>p</i> -dioxins/furans
POPs	Persistent organic pollutants
REACH	Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
ROM	JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations
SF BREF	BAT reference document for the Smitheries and Foundries Industry
STS BREF	BAT reference document on Surface Treatment Using Organic Solvents (including Wood and Wood Products Preservation with Chemicals)
SVHC	Substance of very high concern: a chemical substance (or part of a group of chemical substances) which has to be regulated by REACH if using it within the European Union

Total N	Total nitrogen (TN), expressed as N, includes free ammonia and ammonium nitrogen (NH <sub>4</sub> -N), nitrite nitrogen (NO <sub>2</sub> -N), nitrate nitrogen (NO <sub>3</sub> -N) and organically bound nitrogen
TOC	Total organic carbon, expressed as C (in water); includes all organic compounds
TSS	Total suspended solids
TVOC	Total volatile organic carbon, expressed as C (in air)
TWG	Technical Working Group
US EPA	United States Environmental Protection Agency
VOC	Volatile organic compound (as defined in Article 3(45) of the IED)
WFD	EU Water Framework Directive; Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for the Community action in the field of water policy
WHO-TEF	World Health Organisation toxic equivalence factor
WI BREF	BAT reference document for Waste Incineration
WT BREF	BAT reference document for Waste Treatment
WWTP	Waste water treatment plant

## Participants in the Kick-off Meeting

Acronym	Meaning	Number of delegates in the Kick-off Meeting
<b>Member States</b>		
AT	Austria	2
BE	Belgium	2
CZ	Czech Republic	1
DE	Germany	2
DK	Denmark	2
EL	Greece	1
ES	Spain	5
FI	Finland	2
FR	France	3
IT	Italy	2
NL	Netherlands	2
PL	Poland	1
SE	Sweden	2
UK	United Kingdom	3
<b>Environmental organisation</b>		
EEB	European Environmental Bureau	2
<b>Industry organisations</b>		
CAEF	The European Foundry Association	16
EUROFER	The European Steel Association	3
EUROFORGE	European forging industry association	1
EUROMETAUX	European Association of Metals	2
ORGALIM	Europe's Technology Industries	2
<b>European Commission</b>		
DG ENV	Directorate-General for Environment	1
DG JRC - EIPPCB	Directorate-General Joint Research Centre - European IPPC Bureau	7
		Total: 64

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# 1 INTRODUCTION

## 1.1 Kick-off Meeting for the review of the SF BREF

The Technical Working Group (TWG) for the review of the Reference Document on Best Available Techniques (BAT) for the Smitheries and Foundries Industry (SF BREF) held its first plenary meeting at the JRC premises in Seville, Spain, on 17 – 20 September 2019. This report is a summary of this first meeting (also referred to as the Kick-off Meeting or KoM).

TWGs are set up to facilitate the exchange of information under Article 13(1) of Directive 2010/75/EU (IED) on Industrial Emissions (Integrated Pollution Prevention and Control).

The review of the SF BREF started with the activation of the TWG in July 2018. The SF TWG is made up of about 150 experts representing EU Member States (MS), industry, environmental non-governmental organisations and the European Commission.

The call for the expression of TWG members' initial positions for the review of the SF BREF was sent out by the European IPPC Bureau (EIPPCB) on 22 January 2019, with a deadline for responses of 15 March 2019. Responses were received from 15 Member States, 4 industry organisations and one environmental NGO.

In order to facilitate the discussions at the Kick-off Meeting, a Background Paper (BP) highlighting the items to be discussed was prepared by the EIPPCB and sent to the SF TWG members 12 weeks in advance of the meeting, on 20 June 2019. The term 'EIPPCB proposal' used in the present document refers to the way forward that the EIPPCB proposed to the TWG in the BP after taking into account the TWG members' 'initial positions'. The Kick-off Meeting was attended by 64 TWG members (30 from MS, 24 from industry, 2 from an environmental NGO and 8 from the European Commission).

The meeting started on Tuesday 17 September 2019 in the morning and finished on Friday 20 September 2019 at midday (i.e. the meeting lasted three and a half days). The meeting agenda included presentations and discussions on the exchange of information for the review of the SF BREF (as provided for in Article 13 of Directive 2010/75/EU).

The head of the EIPPCB chaired the meeting and the SF BREF co-authors (i.e. the SF BREF team of the EIPPCB) introduced each topic and led the technical discussions.

During the meeting, discussions were held on the TWG members' initial positions and on the EIPPCB proposals that were based on those initial positions. The key issues on which agreement was sought at the meeting were the scope of the revised SF BREF, the interface with other BREFs, the structure of the revised SF BREF, the key environmental issues (KEIs), the data collection and the next steps for the review of the SF BREF.

The items were discussed following a common pattern at the meeting. The EIPPCB gave a presentation based on the Background Paper for each issue and proposed a way forward. The participants then had the opportunity to discuss each issue and to ultimately reach a conclusion by consensus.

This document presents the main issues discussed for each item and the conclusions reached at the meeting by the TWG.

All presentations given at the meeting are available to TWG members on the BAT Information System (BATIS) workspace together with the conclusion slides of the meeting.

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## 1.2 Introductory presentations at the Kick-off Meeting

The presentation given by a representative of the Directorate-General for Environment of the European Commission (DG ENV) recalled the overall context and legal framework of the SF BREF review as well as the need to focus the information exchange.

The presentation also mentioned three ongoing or recently finalised studies which have been commissioned by DG ENV and which are of interest for the review of the SF BREF: one study about the preliminary identification of key environmental issues (KEIs) for the review of the SF BREF, the second study for the identification and promotion of novel and emerging sustainable techniques (the so-called Innovation Observatory) and the third study on the IED and the Circular Economy.

A member of the EIPPCB gave a general introduction to the *Sevilla process* (i.e. the process to draw up and review BREFs) including the general approach for deriving BAT and BAT-associated emission levels (BAT-AELs). It was made clear in particular that deriving BAT and BAT-AELs is a pragmatic and iterative process involving the whole TWG. In this process, the EIPPCB's responsibility is to make concrete proposals on BAT and BAT-AELs to the whole TWG based on the information collected, especially based on the plant-specific data collected through questionnaires. The TWG is invited to comment on these proposals and to submit any evidence supporting alternative proposals. Decisions on BAT are taken by consensus by the whole TWG at the Final TWG Meeting.

The work of the SF TWG will follow the BREF Guidance for the exchange of information under the IED (i.e. Commission Implementing Decision 2012/119/EU of 10 February 2012).

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## 2 SCOPE

### 2.1 Inclusion of smitheries activity

In the BP, the EIPPCB had proposed to include in the scope of the SF BREF the activities specified in point 2.3(b) of Annex I to the IED: smitheries with hammers the energy of which exceeds 50 kJ per hammer and where the calorific power used exceeds 20 MW.

During the meeting, 2 MS and 2 industry organisations expressed concerns in relation to the small number of IED smitheries installations in Europe and the potential difficulties to collect information and data for those plants. Three other MS and one environmental organisation expressed the opinion that smitheries should be included and at least to seek information as well as collect data. One MS underlined that the small number of IED-size smitheries in Europe is due to the current IED Annex I thresholds which need revising.

The EIPPCB recalled that the smitheries activity is in the IED and that discussion on the IED-covered activities and related thresholds is not within the remit of this TWG.

#### **Conclusions reached by the TWG:**

- To include in the scope of the SF BREF the activities specified in point 2.3(b) of Annex I to the IED: smitheries with hammers the energy of which exceeds 50 kJ per hammer and where the calorific power used exceeds 20 MW.
- The TWG to provide written contributions for drafting the chapters on ‘General information’, ‘Applied processes and techniques’, ‘Techniques to consider in the determination of BAT’ and ‘Emerging techniques’.
- Not to cover forging presses in the scope of the SF BREF.

### 2.2 Ferrous metal foundries

In the BP, the EIPPCB had proposed to cover in the SF BREF the operation of ferrous metal foundries with a production capacity exceeding 20 tonnes per day, as specified in point 2.4 of Annex I to the IED.

During the meeting, some TWG members expressed the opinion that information should be collected from smaller plants (i.e. plants below the IED Annex I point 2.4 threshold) to be included in the descriptive part of the BREF.

#### **Conclusions reached by the TWG:**

- To cover in the SF BREF the operation of ferrous metal foundries with a production capacity exceeding 20 tonnes per day, as specified in point 2.4 of Annex I to the IED.

### 2.3 Interface with other BREFs

#### **2.3.1 Interface with the IS BREF**

In the BP, the EIPPCB had proposed the following:

- To exclude from the scope of the SF BREF the continuous casting of iron and/or steel that is covered by the IS BREF (i.e. to produce thin slabs, thin strips, and sheets).



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- To include in the scope of the SF BREF ferrous metal foundries employing continuous casting processes for the production of grey or nodular iron castings.

Two TWG members requested to include a clarification in order to specify that castings produced in ferrous metal foundries are at or near their final shape. In addition, one MS expressed the opinion that the phrase ‘without further forming’ needs to be included. One industry organisation expressed the opinion that casting is the finished product (final shape) even though there may be some further processing (but no further forming) in the foundry installation, and therefore that the inclusion of ‘at or near their final shape’ would be sufficient. However, one industry organisation indicated that the terminology ‘near-net shape’ was generally used in foundries and could be an alternative option to consider. This proposal was not supported by the TWG. The EIPPCB explained that the scope of the second bullet point is to include continuous casting for the production of grey and nodular iron castings.

**Conclusions reached by the TWG:**

- To exclude from the scope of the SF BREF the continuous casting of iron and/or steel which is covered by the IS BREF (i.e. to produce thin slabs, thin strips, and sheets).
- To include in the scope of the SF BREF ferrous metal foundries employing continuous casting processes for the production of grey or nodular iron castings at or near their final shape.

### **2.3.2 Interface with the NFM BREF**

In the BP, the EIPPCB had proposed the following:

- To exclude from the scope of the SF BREF the production of semi-finished non-ferrous castings requiring further forming that is covered by the NFM BREF.
- To include in the scope of the SF BREF non-ferrous metal foundries using alloyed ingots, internal scrap, recovered products (e.g. external scrap) or liquid metal for the production of castings at or near their final shape.

A number of TWG members expressed the need to clarify the term ‘external scrap’. One MS pointed out that external scrap was not used in their foundries and therefore it was better not to use this terminology at all in order to avoid any potential confusion between installations covered under the NFM BREF and the SF BREF. One industry organisation indicated that there was a clear distinction between secondary smelters covered under the NFM BREF that use external scrap irrespectively of scrap quality and foundries which can also use significant amounts of external scrap but only of high quality (clean scrap). One MS indicated that limiting the potential type of scrap materials used in foundries to internal scrap only was not a realistic approach because foundries do use external scrap of high quality. One MS proposed, as an alternative, to use the general terminology ‘recovered product’ in order to stay in line with the terminology employed in point 2.5(b) of Annex I to the IED. Based on the discussion, it was decided not to use the terminology ‘external scrap’ in the conclusions, but rather to refer to ‘scrap’ in general and to use the term ‘recovered product’ in order to stay in line with the IED. It was noted that the quality of the external scrap used in foundries is a key issue that needs to be considered as part of the SF BREF review.

One environmental organisation expressed the opinion that information on candidate BAT may also be collected from plants below the IED Annex I point 2.5(b) capacity threshold (i.e. melting capacity 4 tonnes per day for lead and cadmium and 20 tonnes per day for all other metals). At this point, it could be mentioned that while preference may be given to information collection on techniques that are applied in IED-size installations, information on techniques applied in non-IED-size plants may be considered useful as long as there is evidence that these techniques can also be applied in IED-size plants.

**Conclusions reached by the TWG:**

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- To exclude from the scope of the SF BREF the production of semi-finished non-ferrous metal products requiring further forming.
  - To include in the scope of the SF BREF the non-ferrous metal foundries using alloyed ingots, scrap, recovered products or liquid metal for the production of castings at or near their final shape.

In addition and in relation to bell and art casting, the EIPPCB had placed this item in Chapter 3 of the BP (items not proposed for discussion during the KoM). No TWG member requested its discussion prior to the KoM, so the proposal was agreed without further discussion.

**Conclusions reached by the TWG:**

- To cover in the SF BREF the operation of non-ferrous metal foundries with a melting capacity exceeding 4 tonnes per day for lead or 20 tonnes per day for all other metals, as specified in point 2.5(b) of Annex I to the IED.
- To exclude from the scope of the SF BREF cadmium, titanium and precious metal foundries, as well as bell and art casting.

### **2.3.3 Interface with the STS BREF**

In the BP, the EIPPCB had proposed to include in the scope of the SF BREF the coating of moulds and cores but to exclude the coating of castings.

The EIPPCB had placed this item in Chapter 3 of the BP (items not proposed for discussion during the KoM). No TWG member requested its discussion prior to the KoM, so the proposal was agreed without further discussion.

**Conclusions reached by the TWG:**

- To include in the scope of the SF BREF the coating of moulds and cores but to exclude the coating of castings.

### **2.3.4 Interface with the EFS BREF**

In the BP, the EIPPCB had proposed the following:

- To include in the scope of the SF BREF foundry-specific aspects of the storage, transfer and handling of materials, including the storage and handling of scrap and sand.
- To refer to the EFS BREF for general issues associated with the storage, transfer and handling of materials.

The EIPPCB had placed this item in Chapter 3 of the BP (items not proposed for discussion during the KoM). No TWG member requested its discussion prior to the KoM, so the proposal was agreed without further discussion.

**Conclusions reached by the TWG:**

- To include in the scope of the SF BREF foundry-specific aspects of the storage, transfer and handling of materials, including the storage and handling of scrap and sand.
- To refer to the EFS BREF for general issues associated with the storage, transfer and handling of materials.

### **2.3.5 Interface with the ICS BREF**

In the BP, the EIPPCB had proposed to exclude indirect cooling systems from the scope of the SF BREF.

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The EIPPCB had placed this item in Chapter 3 of the BP (items not proposed for discussion during the KoM). No TWG member requested its discussion prior to the KoM, so the proposal was agreed without further discussion.

**Conclusions reached by the TWG:**

- To exclude indirect cooling systems from the scope of the SF BREF.

## **2.4 Independently operated waste water treatment plants (WWTPs) and combined treatment of waste water**

In the BP, the EIPPCB had proposed the following:

- To include in the scope of the SF BREF the activity in point 6.11 of Annex I to the IED only if emissions to water are considered a KEI and where the main pollutant load originates from activities in points 2.4 or 2.5(b) of Annex I to Directive 2010/75/EU.

Two MS and one environmental organisation expressed the opinion that the smitheries activity (IED Annex I point 2.3(b)) should also be referred to. Feedback from one industry organisation indicated that waste water is not an issue for smitheries. One industry organisation asked for clarification on how this scope provision is going to be implemented (potentially different operators of the 6.11 WWTPs compared to the foundry operators). One MS asked for the inclusion of combined treatment of waste water from different origins in the event that the main pollutant load originates from 2.4 or 2.5(b) activities.

The EIPPCB recalled that both topics (IED Annex I point 6.11 (Independently operated WWTPs) and combined treatment) have been discussed during many BREF reviews (e.g. TXT, FDM, SA) with the same conclusion. Moreover, the EIPPCB invited MS and industry to promote the participation of relevant independently operated waste water treatment plants (WWTPs) in the plant-specific data collection.

**Conclusions reached by the TWG:**

- To include in the scope of the SF BREF the activity listed in point 6.11 of Annex I to the IED where the main pollutant load originates from activities in points 2.4 or 2.5(b) of Annex I to the IED falling under the scope of this BREF.
- To include the combined treatment of waste water from different origins if the main pollutant load originates from the activities covered in points 2.4 or 2.5(b) of Annex I to the IED falling under the scope of this BREF and the WWTP is not covered by Directive 91/271/EEC.

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### 3 STRUCTURE OF THE SF BREF AND OF ITS BAT CONCLUSIONS

In the BP, the EIPPCB had proposed the following:

- To include a new chapter dedicated to smitheries in the SF BREF (subject to the TWG decision on the scope as discussed in Section 2.1.3) containing sections on:
  - applied processes and techniques;
  - current consumption and emission levels;
  - techniques to consider in the determination of BAT;
  - emerging techniques.
- The TWG to provide written contributions for drafting these chapters.
- To derive BAT conclusions for smitheries (subject to the TWG decision on the scope as discussed in Section 2.1.3) to be incorporated in the BAT conclusions chapter of the revised SF BREF.
- To update Chapter 1 on 'General information' with up-to-date information.
- To significantly revise and update the current Chapter 2 on 'Applied processes and techniques' in foundries with the aim to better reflect the current structure of the foundry sector. A new section in Chapter 2 will be created to expand the information contained in Tables 2.5, 2.7 and 4.19 with the aim to clearly specify the relevance of each process per foundry type.
- To generally keep the structure of the current BREF for Chapter 3 and Chapter 4 and to update the sections therein with new information received from the TWG. In particular, the sections on 'Techniques to consider in the determination of BAT' will be revised and similar techniques will be merged. Techniques may also be further grouped according to their environmental benefits, as this has been done in previous published BREFs.
- The TWG to provide written contributions for drafting the chapters on 'Applied processes and techniques' and 'Techniques to consider in the determination of BAT'.

The TWG generally welcomed the EIPPCB proposal and the discussions were related to whether or not the BAT conclusions chapter as well as the Emerging techniques chapter will be common for both smitheries and foundries activities. Another important point of discussion was brought up by one industrial association concerning the need to provide more clarity in the BREF regarding the current structure of the foundry industrial sector. Nowadays, the foundry sector is divided into six main clusters and it would be important to reflect this in the revision of the SF BREF but also to consider this classification when drafting the questionnaires and potentially when drawing up the BAT conclusions at a later stage. The six clusters proposed for the foundry industrial sector are as follows:

1. iron foundry for mass production (serial production with automatic moulding plant – 'machine moulding');
2. iron foundry for large casting (single piece or small batch production – 'hand moulding');
3. steel casting foundry;
4. non-ferrous sand foundry;
5. non-ferrous permanent mould foundry;
6. non-ferrous pressure die-casting foundry.

#### **Conclusions reached by the TWG:**

##### **For smitheries:**

- To include a new chapter dedicated to smitheries in the SF BREF containing sections on:
  - general information;
  - applied processes and techniques;
  - current consumption and emission levels;

- 
- techniques to consider in the determination of BAT;
  - emerging techniques.
- The TWG (and in particular EUROFORGE) to provide written contributions for drafting this chapter.
  - To derive BAT conclusions for smitheries to be incorporated in the BAT conclusions chapter of the revised SF BREF.

**For foundries:**

- To update the current Chapter 1 on ‘General information’ with up-to-date information.
- To significantly revise and update the current Chapter 2 on ‘Applied processes and techniques’ in foundries with the aim to better reflect the current structure of the foundry sector. A new section in Chapter 2 will be created to expand the information contained in Tables 2.5, 2.7 and 4.19 with the aim to clearly specify the relevance of each process per foundry type.
- Information on the six foundry clusters to be provided by CAEF at an early stage and before the development of the questionnaire.
- To generally keep the structure of the current BREF for Chapter 3 and Chapter 4 and to update the sections therein with new information received from the TWG. In particular, the sections on ‘Techniques to consider in the determination of BAT’ will be revised and similar techniques will be merged. Techniques may also be further grouped according to their environmental benefits, as this has been done in previous published BREFs.
- The TWG to provide written contributions for drafting the chapters on ‘Applied processes and techniques’ and ‘Techniques to consider in the determination of BAT’.

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## 4 PROCESS STEPS IN FOUNDRIES

The EIPPCB had placed this item in Chapter 3 of the BP (items not proposed for discussion during the KoM). No TWG member requested its discussion prior to the KoM, so the proposal was agreed without further discussion.

### **Conclusions reached by the TWG:**

- To cover in the SF BREF the same process steps covered by the current SF BREF, namely:
  - pattern-making;
  - raw materials storage and handling;
  - melting and metal treatment;
  - mould and core production, and moulding techniques;
  - casting or pouring and cooling;
  - shake-out;
  - finishing;
  - heat treatment;
  - sand regeneration.

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## 5 EMISSIONS TO AIR AND TO WATER

### 5.1 Overview

A large part of the meeting was dedicated to the identification of substances/parameters emitted to air and to water by SF installations and for which emission-related data will be collected in a systematic way via questionnaires, with the aim to derive emission levels associated with BAT (i.e. BAT-AELs) or with the aim for the TWG to decide at a later stage, based on the data collected through the plant-specific questionnaires, whether BAT-AELs should be derived. These substances/parameters are called KEIs (key environmental issues). See Section 6 for other KEIs related to energy; chemicals and oils consumption; water consumption and waste water discharge; and residues generation.

For substances/parameters that are not proposed as KEIs, unless specified otherwise, no data will be collected via questionnaires and BAT-AE(P)Ls will not be set, although 'bulk information' on associated techniques can be provided by the TWG (see Section 9).

In the BP, more than 70 substances/parameters (or KEI candidates) emitted to air and to water by SF installations were assessed (as single substances or groups of substances). In the BP to the KoM, all substances/parameters were included, assessed and proposals were made to be concluded on by the TWG. Most of these substances/parameters were discussed during the KoM.

The EIPPCB had assessed those substances/parameters by using an approach based on the following four criteria:

1. What is the environmental relevance of the substance/parameter?
2. What is the significance of the activity?
3. What is the potential for identifying new or additional techniques that would further significantly reduce pollution?
4. What is the potential for BAT-AELs that would significantly improve the level of environmental protection from current emission levels?

This approach was detailed in the BP and in the presentation made at the KoM by the EIPPCB.

This document does not aim to report the detailed discussion that took place for each and every substance/parameter, but focuses only on the most important points. The list of KEIs included in the review of the SF BREF is summarised in Table 1 and Table 3 (Sections 5.2 and 5.3 of this document).

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## 5.2 Emissions to water

### 5.2.1 Emissions to water from foundries

In the BP, the EIPPCB had proposed the following:

- To consider emissions to water a KEI and to include emissions to water from both direct and indirect discharges in the data collection.
- To collect contextual information on the source of emissions to water, the type of treatment (dedicated or combined) and the contribution of the SF activity to the WWTP both in total flow and total load.

One industry organisation asked for clarification on the meaning of the term ‘indirect discharges’ and various MS expressed their views and experiences on how the waste water emissions from foundries are regulated in their jurisdictions.

The TWG discussed the process steps which may be considered relevant for emissions to water. The following processes were identified as particularly relevant:

- die-casting,
- wet flue-gas treatment systems,
- heat treatment,
- surface run-off water from storage,
- direct cooling,
- wet sand regeneration and
- cupola furnace slag granulation.

Most parameters for emissions to water were foreseen for discussion and were discussed during the KoM, while the EIPPCB had placed the rest of the parameters in Chapter 3 of the BP (items not proposed for discussion during the KoM). For the items not requested for discussion prior to the KoM, the proposals were agreed without further discussion.

Based on the proposals made by the EIPPCB in the BP and on the discussions that took place during the KoM for each substance/parameter, the TWG concluded to include in the review of the SF BREF the KEIs for emissions to water which are summarised in Table 1. Furthermore, emissions to water which are concluded NOT to be considered as KEIs to water are summarised in Table 2. However, for some parameters of Table 2 (not considered as KEIs), it was agreed to collect contextual information on discharges.

**Table 1: KEIs for emissions to water included in the review of the SF BREF**

(Groups of) Substance(s)	Remarks – additional conclusions
Amines	Total nitrogen (TN) for direct discharges. To collect information on the specific amine compounds used and their properties
Non-readily biodegradable amines (e.g. DMIPA)	For both direct and indirect discharges
Total nitrogen (TN)	For direct discharges only
Absorbable organically combined halogens (AOX)	For both direct and indirect discharges
Hydrocarbon oil index (HOI)	For both direct and indirect discharges. During the questionnaire development to further define the requested parameter (e.g. HOI vs total hydrocarbons)
Metals (As, Cd, Cr, Cu, Ni, Pb, Zn)	For both direct and indirect discharges
Mercury (Hg)	For both direct and indirect discharges



Cyanide (CN <sup>-</sup> )	For both direct and indirect discharges
Phenols (phenol index)	For direct discharges only
Chemical oxygen demand (COD)	For direct discharges only
Total organic carbon (TOC)	For direct discharges only
Total suspended solids (TSS)	For direct discharges, but to collect data for indirect discharges as contextual information

**Table 2: Parameters concluded as NOT KEIs for emissions to water in the review of the SF BREF**

(Groups of) Substance(s)	Remarks – additional conclusions
Total phosphorus (TP)	NOT a KEI for emissions to water
Other metals (Cr(VI), Al, Co, Mn, Fe, Ba)	NOT KEIs for emissions to water. To collect information for direct and indirect discharges of Co and Mg (i.e. by EEB). To collect information on Ba emissions (i.e. by EEB) One MS expressed its concern on Fe discharges as Fe is considered in the Water Framework Directive (WFD) and national legislation. In addition, to collect contextual information on metal emissions in the case of wet dedusting processes.
Ammonium nitrogen (NH <sub>4</sub> -N)	NOT a KEI for emissions to water, but to collect contextual information for direct discharges
Sulphite (SO <sub>3</sub> <sup>2-</sup> )	NOT a KEI for emissions to water
Total phosphorus (TP)	NOT a KEI for emissions to water
Other parameters, i.e. (Cl <sup>-</sup> ; SO <sub>4</sub> <sup>2-</sup> ; F <sup>-</sup> ; 1,2,4-trimethylbenzene; sulphide, toxicity to fish eggs, PAHs)	NOT KEIs for emissions to water
pH and conductivity	To collect data as contextual information

Additional conclusions reached for substances or parameters (emissions to water) are as follows:

**Conclusions reached by the TWG (generally for emissions to water):**

- To include emissions to water from die-casting, wet flue-gas treatment systems, heat treatment, surface run-off water from storage, direct cooling, wet sand regeneration and cupola furnace slag granulation as a KEI and to include emissions to water from both direct and indirect discharges in the data collection.
- To collect contextual information on the source of emissions to water, the type of treatment (dedicated or combined) and the contribution of the SF activity to the WWTP both in total flow and total load.

**Conclusions reached by the TWG in relation to amines:**

- To collect information on the specific amine compounds used and their properties.
- To include total nitrogen (TN) as a KEI for direct emissions to water and to collect data on TN emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.
- To include non-readily biodegradable amines (e.g. DMIPA) as a KEI for both direct and indirect emissions to water and to collect data on their emissions through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived for non-readily biodegradable amines.

**Conclusions reached by the TWG in relation to AOX:**

- 
- To include AOX as a KEI for both direct and indirect emissions to water and to collect data on AOX emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.

**Conclusions reached by the TWG in relation to hydrocarbon oil index (HOI):**

- To include HOI as a KEI for both direct and indirect emissions to water and to collect data on HOI for emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.

**Conclusions reached by the TWG in relation to metals:**

- To include As, Cd, Cr, Cu, Ni, Pb and Zn as KEIs for both direct and indirect emissions to water and to collect data on As, Cd, Cr, Cu, Ni, Pb and Zn emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.
- Information on Mn, Co and Ba emissions from foundries to be provided by EEB.
- To collect information on the emissions of other metals in the case of wet dedusting processes as contextual information.
- Not to include aluminium (Al) as a KEI for emissions to water and not to collect data on Al emissions to water.
- Not to include Cr(VI) as a KEI for emissions to water and not to collect data on Cr(VI) emissions to water.
- Not to include Ba compounds as a KEI for emissions to water (see also Table 2).
- Not to include Fe as KEI for emissions to water and not to collect data on Fe emissions to water (see also Table 2).
- Not to include Co and Mn as KEI for emissions to water (see also Table 2).

**Conclusions reached by the TWG in relation to mercury:**

- To include mercury (Hg) as a KEI for both direct and indirect emissions to water and to collect data on Hg emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived for Hg.

**Conclusions reached by the TWG in relation to cyanide:**

- To include cyanide (CN<sup>-</sup>) as a KEI for both direct and indirect emissions to water and to collect data on CN<sup>-</sup> emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.

**Conclusions reached by the TWG in relation to phenols (phenol index):**

- To include phenols as a KEI for direct emissions to water and to collect data on phenol emissions to water (as phenol index) through plant-specific questionnaires with the aim to derive BAT-AELs.

**Conclusions reached by the TWG in relation to chemical oxygen demand (COD) and/or total organic carbon (TOC):**

- To include both COD and TOC as KEIs for emissions to water for direct discharges and to collect data on COD and TOC for emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.

**Conclusions reached by the TWG in relation to total suspended solids (TSS):**

- To include TSS as a KEI for emissions to water for direct discharges and to collect data on TSS emissions to water through plant-specific questionnaires with the aim to derive BAT-AELs.
- To collect data on TSS emissions to water for indirect discharges as contextual information.

**Conclusions reached by the TWG in relation to ammonium nitrogen (NH<sub>4</sub>N):**

- 
- Not to include ammonium nitrogen ( $\text{NH}_4\text{-N}$ ) as a KEI for emissions to water but to collect contextual information in the case of direct emissions with the aim to assess the abatement efficiency of the WWTP.

**Conclusions reached by the TWG in relation to sulphite ( $\text{SO}_3^{2-}$ ):**

- Not to include sulphite as a KEI for emissions to water and not to collect data on sulphite emissions to water.

**Conclusions reached by the TWG in relation to total phosphorus (TP):**

- Not to include TP as a KEI for emissions to water and not to collect data on total phosphorus emissions to water.

**Conclusions reached by the TWG in relation to other parameters, i.e.  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$ ,  $\text{F}^-$ , 1,2,4-trimethylbenzene, sulphide, toxicity to fish eggs, PAHs:**

- Not to include  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$  as KEIs for emissions to water, but to collect data in order to obtain contextual information about the waste water treatment.
- Not to include  $\text{F}^-$  as a KEI for emissions to water and not to collect data on  $\text{F}^-$  emissions to water.
- Not to include 1,2,4-trimethylbenzene as a KEI for emissions to water and not to collect data on 1,2,4-trimethylbenzene emissions to water.
- Not to include sulphide as a KEI for emissions to water and not to collect data on sulphide emissions to water.
- Not to include toxicity to fish eggs as a KEI for emissions to water and not to collect data on toxicity to fish eggs.
- Not to include PAHs as a KEI for emissions to water and not to collect data on PAH emissions to water.

**Conclusions reached by the TWG in relation to the collection of data as contextual information for pH and conductivity:**

- To collect data on the following parameters as contextual information:
  - pH;
  - conductivity.

## **5.2.2 Emissions to water from smitheries**

Emissions to water from smitheries are not considered a KEI.

## 5.3 Emissions to air

### General consideration

As stated in the BP, for emissions to air, when derivation of BAT-AELs is mentioned, this refers to channelled emissions.

A total of more than 70 parameters (individual substances or groups of substances) were assessed in the BP for emissions to air from foundries, based on the initial positions (IPs) submitted. The presentation of the KoM conclusion is presented in Section 5.3.1.

For emissions to air from smitheries, the KoM conclusions are presented in Section 5.3.2.

### Conclusions reached by the TWG:

- For emissions to air, when derivation of BAT-AELs is mentioned, this refers to channelled emissions.

### 5.3.1 Emissions to air from foundries

Based on the proposals made by the EIPPCB in the BP and on the discussions which took place during the KoM for each substance/parameter, **the TWG concluded to include in the review of the SF BREF the KEIs for channelled emissions to air which are summarised in Table 3 and to collect data through plant-specific questionnaires for these substances with the aim to derive BAT-AELs (unless mentioned otherwise). The parameters agreed to be considered as KEIs for emissions to air are summarised for each process in Annex II.**

**Table 3: KEIs for emissions to air from foundries included in the review of the SF BREF**

(Groups of) Substance(s)	Type of installation or process	Remarks – additional conclusions
NH <sub>3</sub>	Processes using urea-based binders and/or hexamethylenetetramine hardener	The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived for NH <sub>3</sub> . To collect data on the different types of binders and hardeners used.
B[a]P and PAHs	Metal melting, moulding and casting	The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived for PAHs as a sum and/or for individual compounds particularly relevant for the SF sector.
Cl <sub>2(g)</sub>	Treatment of molten non-ferrous metals where substitution of Cl <sub>2(g)</sub> is not possible	To collect information on techniques to substitute the use of Cl <sub>2(g)</sub> with alternative degassing/cleaning agents that have a lower environmental impact.
NO <sub>x</sub>	All types of furnaces (with the exception of induction furnaces), thermal sand regeneration	For other types of electrically heated furnaces (e.g. electric arc, resistance), to collect data and the TWG to decide at a later stage whether a BAT-AEL should be derived.
SO <sub>2</sub>	Metal melting, casting, moulding, thermal sand regeneration	SO <sub>2</sub> emissions may also arise from using of SO <sub>2</sub> as covering gas.
HCl	Metal melting	The TWG to decide at a later stage whether a BAT-AEL should be derived.
Dust	All processes	-

<b>(Groups of) Substance(s)</b>	<b>Type of installation or process</b>	<b>Remarks – additional conclusions</b>
TVOC	Furnaces using solid, liquid and/or gaseous fuels, moulding, casting, sand regeneration	-
CO	Cupola furnaces	For all other types of furnaces to consider CO as a parameter of contextual information on combustion efficiency.
PCDD/Fs and dioxin-like PCBs	Metal melting when using scrap or fuels (e.g. coke, fuel oils) in particular for shaft furnaces, hot and cold blast cupola furnaces and rotary furnaces, or when using scrap in electrical arc furnaces	To derive BAT-AELs for PCDD/Fs. The TWG to decide at a later stage whether BAT-AELs should be derived for the sum of PCDD/Fs and dioxin-like PCBs. To assess the dioxin-like PCBs data in combination with PCDD/Fs using the WHO-TEQ international toxicity scheme.
HF	Metal melting	The TWG to decide at a later stage whether a BAT-AEL should be derived.
Odour	Cupola furnaces, moulding, core making, casting	The TWG to decide at a later stage whether a BAT-AEL should be derived. To collect information on techniques to prevent and/or reduce diffuse odour emissions.
Amines	Processes using amines in the binding systems	The TWG to decide at a later stage whether a BAT-AEL should be derived. To identify the specific amine compounds for which data will be collected. To collect data on the different types of binders used.
Formaldehyde	Moulding, core-making, casting for processes using binders containing formaldehyde	To collect information on the different types of binders used.
Hg	Metal melting when using scrap or coke	The TWG to decide at a later stage whether a BAT-AEL should be derived.
Metals	Al, As, Cd, Co, Cr <sub>total</sub> , Cr(VI), Cu, Mg, Mn, Ni, Pb, Sb, Se, Sn, Te, Tl, V and Zn	The TWG to decide at a later stage whether BAT-AELs should be derived and for which metals/metalloids or groups of metals. To structure the questionnaire in such a way that will allow - in addition to the individual substance - the reporting of grouped data for metal emissions. Information on Ba and Be emissions from foundries to be provided by EEB.
Phenol	Moulding, core-making, thermal sand regeneration when using binders containing phenols	To collect information on the different types of binders used.
Benzene	Moulding, casting	-
Diffuse emissions	All foundry processes	To collect information on applied techniques and control measures for the minimisation of diffuse emissions from the foundry processes to derive BAT without any associated environmental performance levels.

Most parameters for emissions to air were foreseen for discussion and were discussed during the KoM, while the EIPPCB had placed the rest of the parameters in Chapter 3 of the BP (items not proposed for discussion during the KoM). For the items not requested for discussion prior to the KoM, the proposals were agreed without further discussion.

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It is noted that it is a standard process during the questionnaire development to ask for information on the monitoring standard applied. This is especially important for parameters where an EN monitoring standard is not available.

In addition, a number of conclusions were reached for some substances or parameters / groups of parameters, as follows.

**Conclusions reached by the TWG in relation to noise:**

- To include noise as a KEI and to collect information on techniques applied for noise reduction to derive BAT without any associated environmental performance levels.

**Conclusions reached by the TWG in relation to emissions of oil mist:**

- Not to include oil mist as a KEI but to collect information on techniques used to prevent or reduce oil mist emissions.

**Conclusions reached by the TWG in relation to emissions of furfuryl alcohol:**

- Not to include furfuryl alcohol as a KEI and not to collect data on furfuryl alcohol emissions to air.
- To collect information on the furfuryl alcohol content of furan binders that are employed in foundries.
- To collect information on techniques to reduce the furfuryl alcohol content in furan binders.
- The TWG to explore options to substitute the use of binders containing furfuryl alcohol with alternative binders which have a lower environmental impact.

**Conclusions reached by the TWG in relation to emissions of toluene, ethylbenzene and xylenes (TEX):**

During the KoM discussion, an industry organisation supported the opinion that benzene is the principal compound emitted in moulding and casting in comparison with other compounds including toluene, ethylbenzene and xylenes (TEX). However, some MS and an environmental organisation expressed the view that, in some cases, TEX emissions may be as high as or even higher than those of benzene. Therefore, the following conclusion was reached:

- Not to include toluene, ethylbenzene and xylenes (TEX) as a KEI but to collect data on TEX emissions to air through plant-specific questionnaires as contextual information.

**Conclusions reached by the TWG in relation to emissions of other organic compounds:**

- Not to include styrene and 1,2,4-trimethylbenzene as KEIs and not to collect data.
- Information on styrene emissions from foundries to be provided by ES and EEB.
- Information on 1,2,4-trimethylbenzene emissions from foundries to be provided by EEB.

**Conclusions reached by the TWG in relation to emissions of CMR substances:**

- Not to include CMR substances as a group as a KEI and not to collect data on emissions to air of CMR substances as a group<sup>1</sup>.
- Not to include as KEIs and not to collect data on emissions to air for the following CMR substances:
  - 1,3-butadiene;
  - N-methyl-2-pyrrolidone (NMP);
  - trichloroethylene;
  - 1,2-dichloropropane;
  - 1-bromopropane;

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<sup>1</sup> It is noted that some of the substances/parameters concluded to be included as KEIs in the SF BREF review (see **Table 3**) are classified as CMR. This conclusion refers to the consideration of CMR substances expressed as a group as a KEI.

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- 4,4'diphenylmethanediisocyanate.

**Conclusions reached by the TWG in relation to emissions of SF<sub>6</sub>:**

- Not to include SF<sub>6</sub> as a KEI but to collect information on the substitution of SF<sub>6</sub> by alternative cover gases in magnesium foundries and by alternative degassing agents in aluminium foundries.

**Conclusions reached by the TWG in relation to other proposals:**

- Not to include as KEIs the following parameters:
  - acetone;
  - acrolein;
  - aldehydes;
  - aniline;
  - cresols;
  - hydrogen cyanide;
  - hydrogen sulphide;
  - isocyanic acid;
  - methyl isocyanate;
  - respirable crystalline silica;
  - xylenols.

### 5.3.2 Emissions to air from smitheries

In the BP, the EIPPCB had proposed the following:

- To include as KEIs for smitheries the emissions to air from heating furnaces (i.e. dust, NO<sub>x</sub> and SO<sub>2</sub>) and to collect data on dust, NO<sub>x</sub> and SO<sub>2</sub> emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs.
- Not to include carbon monoxide (CO) as a KEI, but as a parameter in the questionnaires in order to obtain contextual information about combustion efficiency.
- To include noise and vibrations as KEIs for smitheries and to collect information on applied techniques for noise and vibration reduction to derive BAT without any associated environmental performance levels.

One industry organisation expressed the opinion that there are no channelled emissions from smitheries for dust, NO<sub>x</sub> and SO<sub>2</sub>. Another industry organisation expressed the opinion that only natural gas is used as fuel in smitheries, therefore only NO<sub>x</sub> emissions are relevant for smitheries. One MS expressed the view that for channelled emissions dust and metals are relevant parameters. On noise and vibrations, one industry organisation expressed the opinion that both issues are plant-specific and there is no noise or vibration nuisance beyond the plant perimeter. The EIPPCB proposal in the BP was supported by all other TWG members that expressed their views during the discussion on this topic.

After considering all the points made, the TWG concluded as presented below.

**Conclusions reached by the TWG:**

- To include NO<sub>x</sub> as a KEI for smitheries for heating furnaces using exclusively natural gas and to collect data on NO<sub>x</sub> emissions to air through plant-specific questionnaires.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived for NO<sub>x</sub>.
- Not to include carbon monoxide (CO) as a KEI, but as a parameter in the questionnaires in order to obtain contextual information about combustion efficiency.

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- To include noise and vibrations as KEIs for smitheries and to collect information on applied techniques for noise and vibration reduction to derive BAT without any associated environmental performance levels.



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## **6 CONSUMPTION OF ENERGY, CONSUMPTION OF CHEMICALS AND OILS, WATER CONSUMPTION AND WASTE WATER DISCHARGE, RESIDUES GENERATION**

### **6.1 Consumption of energy**

#### **6.1.1 Consumption of energy in smitheries**

In the BP, the EIPPCB had proposed the following:

- To include specific energy consumption as a KEI for smitheries and to collect data through plant-specific questionnaires.
- The TWG to identify during the questionnaire development phase the contextual information needed to understand and compare the data collected.
- The TWG to decide at a later stage, based on the availability and comparability of the data collected through the questionnaires, whether BAT-AEPLs on specific energy consumption can be derived.

One industry organisation expressed the opinion that energy consumption in smitheries is influenced by many parameters such as: the operation regime (e.g. number of shifts, batch production), product portfolio and special products that are usually requested by clients, comparability of data, small number of plants in Europe.

#### **Conclusions reached by the TWG:**

- To include specific energy consumption as a KEI for smitheries and to collect data through plant-specific questionnaires.
- The TWG to identify during the questionnaire development phase the contextual information (e.g. plant configuration, system boundaries, operational regime, level of aggregation of consumption data, product types, energy management systems, energy recovery/reuse flows) needed to understand and compare the data collected.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs on specific energy consumption can be derived.

#### **6.1.2 Consumption of energy in foundries**

In the BP, the EIPPCB had proposed the following:

- To include specific energy consumption as a KEI for melting, holding and heat treatment furnaces and to collect data through plant-specific questionnaires.
- To collect information on techniques and best practices to decrease scrap generation (e.g. increase the operational material efficiency of foundries) in order to minimise energy consumption.
- The TWG to identify, during the questionnaire development phase, the contextual information (in terms of plant configuration, type of processes, level of aggregation of consumption data, raw materials, product specifications, etc.) needed to understand and compare the data collected.
- The TWG to decide at a later stage, based on the availability and comparability of the data collected through the questionnaires, whether BAT-AEPLs on specific energy consumption can be derived.

During the KoM discussion, one industry organisation expressed the opinion that:

- 
- energy consumption in foundries is influenced by many parameters such as: the operation regime (e.g. number of shifts, batch production), product portfolio and special products that are usually requested by clients.
  - it would be necessary to describe energy efficiency plans in detail.
  - any data collection on this topic is meaningless, as the foundry industry is continuously targeting energy consumption reduction.

Another industry organisation expressed the opinion that energy consumption is sufficiently covered under the ETS and it is not necessary to consider this as a stand-alone parameter in the BREF. It was finally proposed to discuss how to combine the IED with other legislation at the IED Article 13 Forum level. One environmental NGO expressed the opinion that emphasis should be given to the decarbonisation of the foundry processes, e.g. type of energy used in melting, alternative fuels, furnace type (as there is a range of more energy-efficient furnace types available to substitute the currently existing ones). One MS underlined the importance of defining the energy system boundaries in order to have reliable and comparable data and of the consideration of possible energy recovery flows. Another MS stressed the importance of considering energy consumption in the BREF. Another MS noted that not all foundries are under the scope of the ETS and that the relation between the ETS and energy efficiency will be useful for the permit writers.

The EIPPCB underlined that the EIPPB proposals are fully in line with European Commission policy and other EU legislation. It was also stressed that energy is considered in both the IED (i.e. ‘use of energy’, IED Article 13(2)) and the BREF Guidance (BREF Guidance, i.e. Commission Implementing Decision 2012/119/EU, in Sections 2.3.5, 2.3.6, 2.3.7, 3.3.2 and 5.4.2) while energy efficiency is an important issue in the context of the Circular Economy. In addition, the importance of operational material efficiency (OME: the ratio of good casting to the total quantity of metal melted) in the overall energy consumption and efficiency in foundries was underlined.

#### **Conclusions reached by the TWG:**

- To include specific energy consumption as a KEI for melting, holding and heat treatment furnaces and to collect data through plant-specific questionnaires.
- To collect information on techniques and best practices to decrease energy consumption (e.g. by energy recovery, reduction of scrap generation).
- The TWG to identify, during the questionnaire development phase, the contextual information (e.g. plant configuration, system boundaries, operational regime, type of furnaces, type of processes and fuels, level of aggregation of consumption data, raw materials, product type, energy management systems, energy recovery/reuse flows) needed to understand and compare the data collected.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs on specific energy consumption can be derived.

## **6.2 Consumption of chemicals and oils**

In the BP, the EIPPCB had proposed the following:

#### **For the consumption of chemicals**

- To consider the consumption of chemicals a KEI and to collect information on techniques used to minimise the consumption of chemicals in the foundry processes.

#### **For the consumption of oils**

- To consider the consumption of oils a KEI and to collect information on techniques used to minimise the consumption of oils in the foundry processes.

#### **For the additionally proposed KEI candidates (control of raw material contamination and soil contamination and decommissioning)**

- 
- To update the information of the current BREF on the techniques and control measures describing raw material storage and handling, decommissioning and control of scrap quality.

**In relation to the consumption of chemicals:**

Two MS expressed their opposition to considering the consumption of chemicals a KEI but they supported the collection of general information. Another two MS underlined the importance of considering chemicals that are characterised as substances of very high concern (SVHC) and to include the consideration of substitution options for hazardous and/or odorous substances. One industry organisation expressed the view that consumption of chemicals strongly depends on a number of parameters and any collected data would be meaningless. They also underlined possible confidentiality issues in collecting such data. An environmental organisation stressed the need to collect information on the types and characteristics of the chemicals used.

**In relation to the consumption of oils:**

One MS and one industry organisation proposed further clarification regarding the terminology used (mould-release agents, lubricating oils).

**Conclusions reached by the TWG:**

- In the context of the Circular Economy, the consumption of chemicals, mould-release agents and lubricating oils is considered important.
- To collect information on techniques used to minimise the consumption of chemicals in the foundry processes.
- Not to collect quantitative data on the consumption of chemicals via the plant-specific questionnaires.
- To collect qualitative information on the selection, types and hazard profiles of the chemicals used in foundries (e.g. resins, catalysts, additives) via the plant-specific questionnaires.
- To collect information on potential substitution techniques to reduce the use of hazardous or odorous chemicals in the foundry processes (e.g. alternative binders).
- To include consumption of mould-release agents and lubricating oils as a KEI and to collect information on techniques used to minimise the consumption of mould-release agents and lubricating oils in the foundry processes.

**Additionally proposed KEI candidates (control of raw material contamination and soil contamination and decommissioning)**

One industry organisation questioned the meaning of the term ‘control measures’ while an environmental organisation proposed the inclusion of monitoring of raw material quality. One MS asked for clarification as to whether chemicals used are included in raw materials and two industry organisations reported that there is an EN standard (EN 13920/1) on scrap quality available as well as a European scrap sort list.

**Conclusions reached by the TWG:**

- To update the information in the current BREF on the techniques relevant to raw material storage and handling, control of scrap quality and decommissioning.
- Information on scrap quality in the aluminium sector to be provided by EUROMETAUX (e.g. EN standard 13920/1 under revision).
- Information on European scrap sort lists (ferrous / non-ferrous metals) to be provided by CAEF.

## **6.3 Water consumption and waste water discharge**

In the BP, the EIPPCB had proposed the following:

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- To include the amount of water consumed and the amounts of waste water discharged as KEIs and to collect data through plant-specific questionnaires. To focus the data collection on gathering quantitative data on water consumption / water discharge at installation level and, additionally, on specific processes for which water consumption is significant and consumption data can be obtained. Based on the assessment above, the following processes could be included in the data collection:
    - cupola furnaces with wet scrubbers;
    - high-pressure die-casting foundries;
    - core production using the SO<sub>2</sub> process, Croning or the cold-box method.
  - To collect the contextual information (water reuse, type of processes, level of aggregation of consumption data, raw materials, product specifications, etc.) needed to understand and compare the data.
  - The TWG to decide at a later stage, based on the availability and comparability of the data collected through the questionnaires, whether BAT-AEPLs on specific water consumption and waste water discharge can be derived.

The TWG agreed in general with the proposal and the discussion mainly focused on the clarification of its wording.

#### **Conclusions reached by the TWG:**

- To include the amount of water consumed and the amounts of waste water discharged as KEIs and to collect data through plant-specific questionnaires. To focus the data collection on gathering quantitative data on water consumption / water discharge at installation level and, additionally, on specific processes for which water consumption is significant and consumption data can be obtained. The following processes could be included in the data collection:
  - abatement processes using wet scrubbers (e.g. cupola furnaces, SO<sub>2</sub> process, cold-box and Croning);
  - moulding with wet sand;
  - high-pressure die-casting foundries.
- To collect the contextual information (water reuse, type of processes, level of aggregation of consumption data, raw materials, product types, etc.) needed to understand and compare the data.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs should be derived for specific water consumption and/or waste water discharge.

## **6.4 Residues generation**

In the BP, the EIPPCB had proposed the following:

- To include the following waste streams as KEIs and to collect data through plant-specific questionnaires with the aim to derive BAT-AEPLs:
  - the amount of slags and dross generated and sent for disposal and/or for internal/external recovery;
  - the amount of swarf recovered internally and the amount of other scrap metal sent for external recycling;
  - the amount of filter dust recycled and/or sent for disposal;
  - the amount of refractory linings recycled and/or sent for disposal in ladles and melting furnaces.
- To include as a KEI the regeneration of foundry sand and to collect data through plant-specific questionnaires on regeneration ratios, the amounts of spent foundry sand externally reused and/or sent for disposal with the aim to derive BAT-AEPLs.

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- The TWG, during the questionnaire development phase, to identify the contextual information (in terms of processes, raw materials, product specifications, etc.) needed to understand and compare the data collected.
  - Not to consider the amounts of spent oils or emulsions and oil-contaminated wastes as a KEI and therefore not to collect quantitative data on these parameters via the plant-specific questionnaires.

During the KoM discussion, one industry organisation expressed the opinion that the quantities of residues generated strongly depend on the type of product and the derivation of any BAT-AEPL will have no real meaning while in some cases it may have a detrimental impact. One MS proposed to take into consideration the system boundaries while another MS proposed to add a reference to the Circular Economy and to amend the proposal to mention that the TWG will decide later on the possible derivation of BAT-AEPLs.

**Conclusions reached by the TWG:**

- To include the following residue as KEIs in the context of the Circular Economy and to collect data through plant-specific questionnaires on:
  - the amounts of slags and dross generated and sent for disposal and/or for internal/external recovery;
  - the amounts of filter dust recycled and/or sent for disposal;
  - the amounts of refractory linings recycled and/or sent for disposal in ladles and melting furnaces.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs should be derived for residues generation.
- To include as a KEI the regeneration of foundry sands and to collect data through plant-specific questionnaires on regeneration ratios, the amounts of spent foundry sands externally used and/or sent for disposal.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs should be derived for the regeneration of foundry sands.
- Information on the sand regeneration processes / systems to be provided by CAEF in advance of the questionnaire development.
- The TWG, during the questionnaire development phase, to identify the contextual information (in terms of processes, raw materials, product type, operational conditions etc.) needed to understand and compare the data collected.
- Not to include the amounts of spent oils and oil-contaminated wastes as a KEI and therefore not to collect quantitative data on these parameters via the plant-specific questionnaires.

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## 7 DATA COLLECTION

### 7.1 General

#### 7.1.1 Expression of BAT-AELs for emissions to air/water

In the BP, the EIPPCB had proposed the following:

- To generally express BAT-AEPLs for emissions to air and to water in concentrations and/or if deemed appropriate as specific loads.
- To include in the data collection the information needed to evaluate emission loads, abatement efficiencies or specific energy consumption.
- During the drafting of the questionnaire(s), to clearly define all parameters influencing emission concentrations, loads or abatement efficiencies (e.g. type of products/raw materials, boundaries of the process, flows of materials, product, pollutants and waste waters, specific operating conditions associated with the manufacture of products).

The TWG broadly agreed with the EIPPCB proposal to generally express BAT-AELs for emissions to air and to water in concentrations and/or if deemed appropriate as specific loads.

It was stressed by one industry organisation that BAT-AELs have to be derived on the basis of mathematics and statistics. Additionally, it was stressed by one MS that information on specific load could be confidential and it might be difficult to collect data on it.

The TWG supported the idea to include in the data collection information specifically on emission loads and profiles, abatement efficiencies, specific energy consumption, monitoring standards and LoD/LoQ of monitoring techniques, where available.

During the drafting of the questionnaire, the TWG agreed to clearly define all parameters influencing emission concentrations, loads or abatement efficiencies (e.g. type of products/raw materials, boundaries of the process, flows of materials, product, pollutants and waste waters, specific operating conditions associated with the manufacture of products). Regarding the LoD/LoQ, it was explained by the EIPPCB that this information is systematically requested in the data collection via questionnaires.

#### **Conclusions reached by the TWG:**

- To generally express BAT-AEPLs for emissions to air and to water in concentrations and/or if deemed appropriate as specific loads.
- To include in the data collection information specifically on emission loads and profiles, abatement efficiencies, or specific energy consumption and LOD/LOQ of monitoring techniques, where available.
- During the drafting of the questionnaire(s), to clearly define all parameters influencing emission concentrations, loads or abatement efficiencies (e.g. type of products/raw materials, boundaries of the process, flows of materials, product, pollutants and waste waters, specific operating conditions associated with the manufacture of products).

#### 7.1.2 Averaging periods for BAT-AELs

In the BP, the EIPPCB had proposed the following:

- For channelled emissions to air, to generally express BAT-AELs as short-term averages, i.e. as daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).

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- For emissions to water, to generally express BAT-AELs as daily averages, obtained via 24-hour flow-proportional composite samples. To complement that:
    - time-proportional composite samples may also be considered provided that sufficient flow stability is achieved;
    - spot sampling may also be considered provided that the effluent is appropriately mixed and homogeneous.

During the meeting, the TWG supported the EIPPCB proposal made in the BP to generally express BAT-AELs for emissions to air as short-term averages and BAT-AELs for emissions to water as daily averages. A MS asked for the inclusion of a specific reference to the case of batch discharge.

**Conclusions reached by the TWG:**

- For channelled emissions to air, to generally express BAT-AELs as short-term averages, i.e. as daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).
- For emissions to water, to generally express BAT-AELs as daily averages, obtained via 24-hour flow-proportional composite samples. To complement that:
  - time-proportional composite samples may also be considered provided that sufficient flow stability is achieved;
  - spot sampling may also be considered provided that the effluent is appropriately mixed and homogeneous;
  - average values over the release duration, taken as flow-proportional composite samples, may be considered in the case of batch discharges.

### **7.1.3 Collection of data on consumption of energy, water, materials and generation of residues**

In the BP, the EIPPCB had proposed the following:

- To collect data on energy consumption expressed as specific energy consumption (ratio of total energy consumption divided by a suitable activity rate figure), on a yearly average basis.
- To collect data on water consumption expressed as specific water consumption (e.g. m<sup>3</sup>/tonne of product for the following processes: cupola furnaces with wet scrubbers; high-pressure die-casting foundries; core production using the SO<sub>2</sub> process, Croning or the cold-box method, on a yearly average basis.
- To collect data on waste water discharge expressed as specific waste water discharge (yearly average).
- To collect data on waste generation expressed as specific waste generation on an annual basis for the following streams;
  - the amount of slags and dross generated;
  - the amounts of filter dust recycled and/or sent for disposal;
  - the amounts of refractory linings recycled and/or sent for disposal in ladles and melting furnaces.
- In addition, to collect data on the foundry sand regeneration ratio expressed as a percentage.

An industry organisation expressed concerns on the representability of the data that would be collected, the amount of contextual information needed to be collected and possible confidentiality issues in relation to the requested information. Two MS stressed that the conclusion wording needs to leave flexibility for the questionnaire development phase of the process.

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**Conclusions reached by the TWG:**

- To collect data on energy consumption expressed as specific energy consumption (ratio of total energy consumption divided by a suitable activity rate figure), on a yearly average basis.
- To collect data on water consumption expressed as specific water consumption (e.g. m<sup>3</sup>/tonne of product) in particular for the following processes: wet scrubber abatement systems for cupola furnaces, SO<sub>2</sub> process, cold-box and Croning, wet sand moulding and high-pressure die-casting foundries, on a yearly average basis.
- To collect data on waste water discharge expressed as specific waste water discharge (ratio of total waste water discharge divided by a suitable activity rate figure), on a yearly average basis.
- To collect data on residues generation expressed as specific residues generation on an annual basis for the following streams;
  - the amount of slags and dross generated;
  - the amounts of filter dust recycled and/or sent for disposal;
  - the amounts of refractory linings recycled and/or sent for disposal in ladles and melting furnaces;
- In addition, to collect data on the foundry sand regeneration ratio expressed as a percentage.
- Information on the relevant parameters needed to design the questionnaire to be provided by CAEF, EUROFORGE and any other interested TWG member in advance of the questionnaire development.



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## 7.2 Selection of plants

### 7.2.1 IED Annex I, activities 2.3(b), 2.4 and/or 2.5(b) and proposal of well-performing plants

In the BP, the EIPPCB had proposed the following:

- To collect data from well-performing IED plants carrying out 2.4 and/or 2.5(b) activities and directly associated activities.

The proposal made by the EIPPCB was agreed without further discussion. Editorial amendments have been made to the conclusions presented on the last day of the KoM to better reflect the inclusion of IED activity 2.3(b) (smitheries) (see Section 2.1 of this document) and for text consistency/clarity reasons. In addition, the EIPPCB explained that an Excel template will be posted on BATIS for the TWG to submit their proposals for well-performing plants.

#### **Conclusions reached by the TWG:**

- To collect data from well-performing plants carrying out activities covered under points 2.4 and/or 2.5(b) of Annex I to the IED and directly associated activities falling under the scope of this BREF.
- To collect data from well-performing plants carrying out activities covered under point 2.3(b) of Annex I to the IED.
- The TWG to complete their proposals of well-performing (including best-performing) plants/installations to be included in the data collection, if necessary after consultation with the national smitheries and foundry organisations, by the beginning of February 2020.
- EIPPCB to finalise the list and to check its completeness by mid-February 2020. This might imply additional requests for information to individual TWG members.

## 7.3 Questionnaire for gathering plant-specific information and data

The EIPPCB proposal in the BP was agreed without further discussion.

#### **Conclusions reached by the TWG:**

- To follow the established BREF process for the collection of plant/installation-specific data via questionnaire.

### 7.3.1 Collection of data at process level

The EIPPCB proposal in the BP was agreed without further discussion.

#### **Conclusions reached by the TWG:**

- To collect information at the process level, when available, for the parameters agreed as KEIs. The processes for which specific data and contextual information will be requested will be further determined during the questionnaire development phase.

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### 7.3.2 Data collection procedure

The EIPPCB proposal in the BP was agreed without further discussion.

#### **Conclusions reached by the TWG:**

- To follow the established BREF review process for the collection of plant/installation-specific data via questionnaires including the following:
  - the preparation of the draft questionnaire by the EIPPCB followed by the commenting of the whole TWG, if necessary in several iterations;
  - if it is deemed necessary, the organisation of a questionnaire development workshop to finalise the questionnaire;
  - the testing of the draft final questionnaire by a selected (small) number of plants/installations;
  - the preparation of the final questionnaire by the EIPPCB;
  - the distribution of the final questionnaire to the participating plants through the Member States' competent authorities;
  - the filling in of the questionnaire by the participating plants/installations;
  - the collection of the filled-in questionnaires by Member States' representatives;
  - the quality check of the filled-in questionnaires by Member States' representatives (possibly with the help of a checklist that the TWG/EIPPCB could have developed);
  - the submission of the quality-checked questionnaires to the TWG via BATIS by Member States' representatives.
- The TWG, in particular the MS, to decide on the possible involvement and contribution of national smitheries and foundries organisations in the data collection.
- To collect data over the years 2019, 2018 and 2017 or for the last three measurement campaigns in the case of a longer measurement frequency.

In relation to the last bullet point of the conclusions above, it is noted that in case of longer monitoring frequencies (e.g. once every 2 years), the last three measurement campaigns will be considered.

## 7.4 Confidentiality issues

In the BP, the EIPPCB had proposed to design the questionnaire in a way that avoids requesting confidential data, and to decide at a later stage (e.g. during the workshop on the questionnaire finalisation) on the type and format of potentially confidential information (CBI). One industry organisation asked for clarification on the submission and handling of confidential information that may be included in the submitted questionnaires. One environmental organisation expressed the opinion that MS competent authorities would have access to CBI from plants from other MS. The EIPPCB explained the general procedures on submission, assessment, storage and presentation of CBI, reminding the TWG of the general principles of the BREF Guidance (Section 5.3 of the BREF Guidance) and underlining that emission data could not be considered confidential. The TWG appreciated the explanations given by the EIPPCB. This proposal received broad support from the TWG.

#### **Conclusions reached by the TWG:**

- To design the questionnaire in a way that avoids requesting confidential data as much as possible so that the data provided by operators can be posted directly onto BATIS and shared with the whole TWG.
- The TWG to decide at a later stage (i.e. during the questionnaire development) about the type and format of potentially confidential information that needs to be collected (e.g. quantity of raw materials treated and plant's actual production).
- The Member States' representatives in the TWG to:

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- submit the versions of the questionnaires containing the confidential information directly to the EIPPCB via email; and
  - post the versions of the questionnaires containing the non-confidential information to BATIS.

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## **8 TECHNIQUES TO CONSIDER IN THE DETERMINATION OF BAT AND EMERGING TECHNIQUES**

As was explained during the KoM, full lists of techniques for both candidate BAT and emerging techniques have been uploaded on BATIS and the TWG is kindly asked to provide additional feedback. The uploaded tables are structured as follows:

- Part 1 – Techniques to consider in the determination of BAT: Techniques in Chapter 4 of the current SF BREF (2005).
- Part 2 – Additionally proposed candidate BAT: Candidate BAT proposed in the course of expression of Initial Positions (IPs) by some of the TWG members.
- Part 3 – Emerging techniques: Emerging techniques in the current SF BREF (2005).
- Part 4 – Additionally proposed Emerging techniques: Candidate Emerging techniques proposed in the course of expression of Initial Positions (IPs) by some TWG members.

For all lists, the EIPPCB already included (in the uploaded template on BATIS) an initial assessment and a proposal for the way forward as well as additional information (including relevant references / sources).

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## 9 NEXT STEPS TO BE TAKEN AFTER THE MEETING

During the final session of the meeting, the TWG agreed on the following actions and timetable for the next steps to be taken.

Step	Targeted time
EIPPCB to issue the first draft questionnaire	End of October 2019
TWG to provide feedback on the first draft questionnaire	End of November 2019
EIPPCB to issue the second draft questionnaire	Middle of December 2019
Workshop on the questionnaire finalisation (if necessary)	End of January 2020
TWG to provide proposals of well-performing plants for the data collection	Beginning of February 2020
EIPPCB to compile the list of well-performing plants and to check its completeness; if necessary, EIPPCB to ask TWG members to amend/complete the list	Middle of February 2020
EIPPCB to issue the third draft questionnaire	Middle of February 2020
Questionnaire testing	End of February 2020
EIPPCB to issue the final questionnaire to the TWG and distribution to the participating plants through the Member States' competent authorities	Middle of March 2020
TWG to provide bulk information in order to update the SF BREF (e.g. information on applied processes and techniques, techniques to consider in the determination of BAT)	End of March 2020
Submission of filled-in questionnaires in BATIS	Middle of June 2020

### 9.1 Site visits

The EIPPCB also asked the TWG members to make proposals for site visits in the coming months, as provided for in Section 4.4.4 of the BREF Guidance.

#### Conclusions reached by the TWG:

- EIPPCB to contact the TWG members that have proposed to organise site visits. Ideally, visits to take place during the testing phase of the questionnaire (November 2019 to February 2020).
- Additional proposals for site visits to be submitted by the TWG.

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## **10 ANNEX I: STANDARD STRUCTURE FOR DESCRIBING THE 'TECHNIQUES TO CONSIDER IN THE DETERMINATION OF BAT'**

When providing information on 'Techniques to consider in the determination of BAT', the use of a standard structure is required in order to enable comparisons of techniques so that an objective assessment against the definition of BAT given in the IED can be made. This standard structure is stipulated in the BREF Guidance. It is necessary to use this standard structure for the provision of information for specific techniques.

# Standard structure for describing BAT candidate techniques (see BREF Guidance)

In order to determine BAT, all techniques to be considered in the BAT decision-making process will be presented in the BREF according to a standard structure, shown in the first two columns of the following table. The third column gives more details on the specific data which are needed in order to draft ‘Techniques to consider in the determination of BAT’ and to derive useful BAT conclusions from them.

Name of the type of information	Type of information to be included in the BREF	Important information to collect and to report
<b>Description</b>	A brief description of the technique with a view to being used in the BAT conclusions.	
<b>Technical description</b>	A detailed and concise technical description of the technique (including chemical or other equations, pictures, diagrams and flow charts when appropriate).	The description can include both prevention and control techniques (in-process and end-of-pipe).
<b>Achieved environmental benefits</b>	The main potential environmental benefits (including reduced consumption of energy, reduced emissions to water, air and land, raw material savings as well as production yield increases, reduced waste, etc.) to be gained through implementing the technique.	
<b>Environmental performance and operational data</b>	Actual plant-specific performance data (including consumption and emission levels, consumption levels – of raw materials, water, energy – amounts of residues/wastes generated, including reference conditions – e.g. O <sub>2</sub> level – and monitoring methods used) achievable applying the technique. Any other information on how to design, operate, maintain and control the technique.	<p><u>Emission data</u></p> <ul style="list-style-type: none"> <li>• Both the concentration and (specific) load of pollutant(s) (if available) or the data needed to derive this information. For specific load data, the product referred to should be clearly defined.</li> <li>• The quantity of the pollutant before and after the abatement system in order to determine the abatement efficiency.</li> <li>• Details of relevant operating conditions (percentage of full capacity, fuel composition, bypassing of the abatement technique, inclusion or exclusion of other than normal operating conditions, reference conditions).</li> <li>• Emission monitoring issues (including information on frequency, averaging period, uncertainties, plant operating condition, etc.).</li> </ul> <p><u>Consumption data:</u></p> <ul style="list-style-type: none"> <li>• The type and amount of fuel, energy (heat, electricity), water and raw materials/chemicals consumed/used by the technique.</li> </ul> <p><u>Waste:</u></p> <ul style="list-style-type: none"> <li>• The type and quantities of waste generated and treatment/disposal methods and/or techniques to prevent waste.</li> </ul> <p><u>Others:</u></p> <ul style="list-style-type: none"> <li>• Sensitivity and durability of the technique.</li> <li>• Operation/control/maintenance issues.</li> <li>• Issues regarding accident prevention.</li> </ul>
<b>Cross-media effects</b>	Relevant negative environmental effects due to implementing the technique, allowing a comparison amongst techniques in order to assess the impact on the environment as a whole (such as consumption and nature of raw materials and	The Reference Document on Economics and Cross-media Effects (ECM) is a document that should be taken into account with regard to cross-media aspects as far as there are significant cross-media effects. This document is available from the European IPPC Bureau website at

Name of the type of information	Type of information to be included in the BREF	Important information to collect and to report
	water, energy consumption and contribution to climate change, stratospheric ozone depletion potential, photochemical ozone creation potential, acidification resulting from emissions to air, particulate matter in ambient air (including microparticles and metals), eutrophication of land and waters resulting from emissions to air or water, oxygen depletion potential in water, persistent/toxic/bioaccumulable components (including metals), generation of residues/waste, limitation of the ability to reuse or recycle residues/waste, generation of noise and/or odour, increased risk of accidents.	<a href="http://eippcb.jrc.ec.europa.eu/reference/BREF/ecm_bref_0706.pdf">http://eippcb.jrc.ec.europa.eu/reference/BREF/ecm_bref_0706.pdf</a>
<b>Technical considerations relevant to applicability</b>	Indication as to whether the technique can be applied throughout the sector; otherwise, information on the main general technical restrictions on the use of the technique (including an indication of the type of plants or processes within the sector to which the technique cannot be applied, and constraints to implementation).	
<b>Economics</b>	Information on costs (both investment and operational) and possible savings, including details on how these costs have been calculated	<ul style="list-style-type: none"> <li>• Capital/investment, operating and maintenance costs including details on how these costs/savings have been calculated/estimated.</li> <li>• Possible savings (including payback time), including details on how these costs/savings have been calculated/estimated.</li> <li>• Cost data will preferably be given in euros (EUR). If a conversion is made from another currency, the data in the original currency and the year when the data were collected will be indicated. This is important as conversion rates vary over time.</li> <li>• Price/cost of equipment or service will be accompanied by the year it was purchased.</li> <li>• Information relevant to both new and existing plants enabling, where possible, the determination of the economic viability of the technique for the sector concerned.</li> <li>• Information on the cost-effectiveness of the technique (e.g. in EUR per abated mass of pollutant), where relevant.</li> </ul> <p>The Reference Document on Economics and Cross-media Effects (ECM) and the JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations (ROM) should be taken into account with regard to economic aspects and monitoring costs, respectively. Both documents are available from the European IPPC Bureau website at <a href="http://eippcb.jrc.ec.europa.eu/reference/">http://eippcb.jrc.ec.europa.eu/reference/</a></p>
<b>Driving force for implementation</b>	Local conditions or requirements (e.g. legislation, safety measures) or non-environmental triggers (e.g. increased yield, improved product quality, economic incentives) which drive or may stimulate implementation. Information on reasons other than environmental ones for implementation.	<p>Examples:</p> <ul style="list-style-type: none"> <li>• information on type/quality of receiving waters (e.g. temperature, salinity);</li> <li>• information on environmental quality standards;</li> <li>• information on the increase of production or productivity.</li> </ul>
<b>Example plants</b>	Reference to plants in which the technique is implemented and from which information has been collected and used in writing the section, including an indication of the degree to which the technique is in use in the EU or worldwide.	
<b>Reference literature</b>	Literature or other reference material that was used in writing the section and that contains more detailed information. When the reference material consists of a large number of pages, reference will be made to the relevant page(s) or section(s).	



## 11 ANNEX II: KEIS FOR EMISSIONS TO AIR BY PROCESS

	NH <sub>3</sub>	BaP	PAHs	Cl <sub>2</sub>	NOx	SO <sub>2</sub>	HCl	Dust	TVOC	CO	PCDD/F	Dioxin-like PCB	HF	Odour	Amines	Formaldehyde	Hg	Metals	Phenols	Benzene	Diffuse emissions	Noise
Pattern-making								X										X			X	X
Raw material storage and handling	X							X							X			X			X	X
Melting and metal treatment		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X	X
<del>Mould and core production, and moulding techniques</del>																						
- moulding	X	X	X			X		X	X					X	X	X			X	X	X	X
- core-making production	X	X	X			X		X	X					X	X	X			X	X	X	X
<del>Casting or pouring and cooling</del>																						
- casting or pouring	X	X	X			X		X	X					X	X	X		X	X	X	X	X
- cooling	X	X	X			X		X	X					X	X	X		X	X	X	X	X
Shake-out	X	X	X					X	X					X	X	X		X	X	X	X	X
Finishing								X										X			X	X
Heat treatment					X	X		X		X								X			X	X
Sand regeneration					X	X		X	X						X			X	X		X	X