

# **IPPC-Directive and Best available techniques (BAT / BREF) for Sorting Technology**

**Siegfried Kalmbach**

Umweltbundesamt, Dessau

## **IVU- Richtlinie und beste verfügbare Techniken (BVT / BREF) für den Bereich der Sortiertechnik**

### **Abstract**

The IPPC-Directive of the EU demands the application of the "best available techniques" (BAT), in Germany still referred to as "state of the art", for all environmentally relevant installations and an "integrated plant authorization". As of 30 Oct. 2007 at the latest this also applies to all existing installations. The Europe-wide exchange of information for the BAT is secured by the BAT reference documents (BREFs) which are worked out in the "Sevilla -Process".

This paper explains the significance and use of these documents for the Member States as well as the implementation into the national body of regulations in Germany. For the field of sorting techniques the most important harmonization results of the "Sevilla-Process" are described.

### **Keywords**

BAT reference document, BREF, best available techniques, state of the art, IPPC-Directive, Waste Framework Directive, Sevilla-Process, technical instructions on air quality control, waste treatment plants, sorting techniques

## **1 Guidelines of the European Union**

The EC-Directive 96/61 relating to the integrated pollution prevention and control (IPPC-Directive) of 24 Sept. 1996 [1] entered into force on 30<sup>th</sup> Oct. 1996 and was to be incorporated into national law at the latest three years after its taking effect. The IPPC-Directive regulates the authorization of environmentally relevant industrial installations, which includes waste disposal plants, on the basis of an integrated, cross-media concept, on application of the "best available techniques" (BAT), which are still referred to as "state of the art" in Germany. This approach covers emissions into air, water and soil as well as waste-industrial aspects, energy efficiency and resource conservation as well as the prevention of accidents. The aim of the IPPC-Directive is to put this concept into practice on EU-level and thus ensure a high level of protection of the environment as a whole, especially by:

- the application of the "best available techniques" (BAT),
- the Europe-wide exchange of information for the clear definition of the BAT,
- public and integrated (cross-media) plant authorization.

The essential element is the requirement of applying the BAT on all new plants, and as of 30 Oct. 2007 at the latest also on all existing installations.

The Europe-wide exchange of information for the clear definition of the BAT follows the guidelines of the IPPC-Directive via BAT reference documents, also called **BREFs** (= **Best Reference Documents**), in the "Sevilla-Process".

In Germany, it was already before the IPPC-Directive came into effect that plants which were particularly environmentally relevant and listed in column 1 of the Ordinance on Installations Requiring a Permit – 4. BImSchV [2], were permitted in an authorization process which includes public participation. In those processes limit values for emissions are set which are based at least on the state of the art of the pollution prevention and control. Hence, the guidelines of the IPPC-Directive are not entirely new to Germany.

The IPPC-Directive defines the term BAT in Art. 2 No. 11 as follows

*"...the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole:*

- *"techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;*

- *"available" techniques are those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;*

- *"best" means most effective in achieving a high general level of protection of the environment as a whole.*

*Furthermore, Annex IV (of the IPPC-Directive) of the Directive contains a list of "considerations to be taken into account generally or in specific cases when determining best available techniques."*

The work schedule of the EU intends to codify the results of the Europe-wide exchange of information in 33 BREFs. Until the end of March 2007 25 BREFs have already been passed and for the remaining ones drafts have been submitted. The BREFs are coordinated and implemented in the EU's office in Seville, the „European Integrated Pollution Prevention and Control Bureau“ (EIPPCB), with the cooperation of the "Technical Working Groups" (TWGs). The TWGs consist of national experts from the Member States as well as plant operators and representatives of industrial associations and environmental groups. For Germany, the Federal Environment Agency is according to Art. 16, para. 4 of

the IPPC-Directive the National Focal Point for the cooperation in this process. Apart from that, the Federal Environment Agency is represented in the "Exchange of information Forum (IEF) of the EU-Commission (COM).

## 2 Implementation of the EU-Guidelines in Germany

The implementation of the IPPC-Directive into German law took place with the so-called "Artikelgesetz" (Separate Act) of 2001 [3], in particular the definition of the term "state of the art" so far used in German environmental laws was adjusted to the "best available techniques" of the IPPC-Directive.

In the law on waste, the implementation of the BAT-definition was carried out through the amendment of the "state of the art"-definition in sect. 3, para. 12 of the Federal Recycling and Waste Management Act [4] and through the word-for-word transposition of the "Criteria for Determining the State of the Art" from the Annex IV of the IPPC-Directive into the Annex III of the Federal Recycling and Waste Management Act.

Identical definitions and annexes were also added to the Federal Immission Control Act [5] and the Federal Water Act [6]. The term "state of the art", however, was maintained in the German law.

The following excerpt from Annex III of the Federal Recycling and Waste Management Act "Criteria for Determining the State of the Art" deals with the significance of the EU-guidelines. In this context **criterion 12** is of major importance as it describes the binding character of the BAT reference documents:

*"In determination of the state of the art, the following criteria, in particular, are to be taken into account, also taking into account the proportionality between the costs and benefits of possible measures and the principle of precaution and prevention, and, in each case, with regard to facilities of a specific type:*

1. Use of low-waste technology,
2. Use of less hazardous substances,

.....

**12. Information** published by the Commission of the European Communities pursuant to Art. 16 (2) of Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (OJ EC NO. L 257 p. 26) or by international organisations."

The information of criterion 12 are above all the harmonization results of the exchange of information according to Art. 16, para. 2 of the IPPC-Directive on the "best available techniques" or in other words the BAT reference documents or BREFs. They are consequently not legally binding but have a high factual significance as source of insight and, due to their competent information, they are intended to influence the decision-making of the environmental inspectorates. It can therefore be expected that the infor-

mation in the BREFs will act as an important technical basis for the authorization of plants in the future.

In Germany, the information in the BAT reference documents are used corresponding to the experienced handling of the federal regulations publisher for the adaptation of subordinate regulations, such as administrative regulations (e.g. Technical Instructions on Air Quality Control) or implementing ordinances (e.g. Waste Water Ordinance or Ordinance on Biological Waste Treatment Plants), to the developed state of the art. This also corresponds to the prevention rule of the Federal Immission Control Act, which states the aim of reducing and limiting emissions according to the state of the art, and ensures at the same time the nationwide uniform interpretation of the state of the art in the plant authorization process. With the specification of the emissions limit values in the subordinate regulations, possible shifts of disadvantageous consequences from one subject of protection to another and thus the integrative or cross-media aspects are taken into account.

The central regulation for the execution of the BAT reference documents are the Technical Instructions on Air Quality Control [7]. They contain the emission limits for almost all commercial and industrial installations as well as for waste disposal plants. BAT reference documents that were at the time already passed by the EU or almost completed BREF drafts submitted to the TWGs were taken into consideration for the amendment of the emission limit requirements of the Technical Instructions on Air Quality Control of 2002.

For future deviations between the Technical Instructions on Air Quality Control and the BREFs published by the COM, the question is raised whether the state of the art in the Technical Instructions on Air Quality Control 2002 is still interpreted correctly. To avoid insecurities in the matter, the Technical Instructions on Air Quality Control specifies in No. 5.1.1 that all BAT reference documents which had been submitted at the time of its passing have been considered. It furthermore states that BAT documents published afterwards do not invalidate the demands of the Technical Instructions on Air Quality Control. So for the time being, the authorities' binding towards the Technical Instructions on Air Quality Control remains in force. An advisory committee established by the Federal Ministry for the Environment which consists of competent representatives in the sense of Art. 51 of the Federal Immission Control Act ("Parties Concerned") investigates in how far more demands can be derived from the information of the BAT reference documents than are already included in the Technical Instructions on Air Quality Control. The committee then has to say in how far the state of the art has developed further in comparison to the specifications of the Technical Instructions on Air Quality Control or in how far the specifications of this administrative regulation need amending. In case the Ministry for the Environment states a progress of the state of the art or a necessary

amendment of the Technical Instructions on Air Quality Control due to the commission's findings, the authority's binding towards the Technical Instructions on Air Quality Control 2002 is suspended. The competent authorities then are supposed to determine the "state of the art" or the "Best available techniques" by using the existing sources of insight, including first and foremost the BAT reference documents [8], and consider them for their decisions.

How intensively the individual EU-Member States actually use the BREFs within the framework of the national authorization practice, is not quite clear yet. The IPPC-Directive indeed offers a certain scope for its execution. Several Member States are currently preparing guidelines on how the BREFs are to be taken into account, others (such as Germany) include the information from the BREFs into their subordinate regulations [9].

The fact that the EU publishes only a short summary of the BREFs in each of the official EU-languages has an impeding effect on the execution and application of the BREFs. The complete and very extensive documents are only officially authorized and available in English.

The German government and the federal states have agreed on a German translation of selected BREF-chapters in order to achieve a more practical use of the documents in the German-speaking EU-Member States. A number of translations have been produced in cooperation with Austria and Luxembourg [10].

The completed German translations as well as all COM-passed BREFs in English, including the summaries translated into German, are available free of charge on the internet pages of the Federal Environment Agency ([www.bvt.umweltbundesamt.de](http://www.bvt.umweltbundesamt.de)).

### **3 BAT-document (BREF) "Waste Treatments Industries"**

Regarding the development of the BREFs one should remark that the "Sevilla-Process" already proofed a complex project in Europe-wide relatively homogenous industries, such as the glass or cement industry. This process was even more complex and confusing in the waste sector which is already strongly regulated throughout the EU and characterized by differing legal definitions, generally used terms, concepts and proceedings. On top of that, there is a great heterogeneity of the "treatment materials" as well as a number of treatment techniques.

Europe-wide recycling and removal processes are conducted in waste treatment plants. In contrast to other industries, it is not considered typical in this sector to manufacture a product. Rather should waste treatment plants according to general understanding de-

liver a service for society in form of the treatment of waste. Yet it is known that products do result from some waste treatments.

The following table 1 illustrates a listing by the TWG of the waste treatment plants existing in the EU. It also shows that most plants are chemical/physical treatment plants.

**Table 1** Waste treatment plants

Type of Waste Treatment	Number of known installations
Physico-chemical treatments	9907
Waste transfer	2905
Biological treatments	615
Preparation and use of waste oil as fuel	274
Waste fuel preparation	266
Inorganic waste treatment (excluding metals)	126
Waste solvent treatment	106
Re-refining of waste oil	35
Activated carbon treatment	20
Recovery of pollution abatement	20
Waste catalyst treatment	20
Waste acid/base treatment	13
<b>Total</b>	<b>approx. 14,300</b>
<p><b>Note:</b>  <i>Figures in this table may be different to actual numbers mainly due to two reasons: On the one hand, these figures underestimate the number of installations in Europe because some EU countries have not reported their number of installations. On the other hand, these numbers typically include all capacities so the number of installations falling under IPPC may be lower.</i></p>	

Already before the TWGs began their work, the COM discussed the number of waste-relevant BREFs. The Annex I of the IPPC-Directive ("Categories of Industrial Activities") was looked at in particular. There, the "Waste Treatments Industries" figure under No. 5. This number is subdivided into four groups:

- Installations for the disposal or recovery of hazardous waste (No. 5.1)
- Installations for the incineration of municipal waste (No. 5.2)
- Installations for the disposal of non-hazardous waste (No. 5.3)
- Landfills (No.5.4)

Deviating from Annex I of the IPPC-Directive, the COM decided to reduce the number of waste-relevant BREFs to two, the fields of "waste incineration" and "waste treatment". The field of "waste treatment" includes accordingly all treatment processes apart from "waste incineration". The field of "landfilling" was dropped because according to the COM's opinion it is already sufficiently regulated in the EC-Directive on waste disposal 1999 [11].

For the BREF "Waste Treatments Industries" it was furthermore decided to concentrate for the time being – depending on the available information – on the selected waste treatment processes of the numbers 5.1 and 5.3 of Annex I of the IPPC-Directive. Due to the not clearly specified relevant area of applicability in the Annex I of the IPPC-Directive and the treatment techniques which have advanced in the meanwhile, the inclusion of certain waste treatment processes into the BREF, such as composting and slag processing, were in dispute for a long time.

The Recovery (R) and Disposal (D) (R/D) codes of Annexes II A and II B of the Directive on Waste (Directive 75/442/EC [12], or 2006/12/EC – consolidated version [13]) which refer to the IPPC Directive changed according to the Commission Decision 96/350/EC [14]. Because this last amendment corresponds to the most recent classification of R/D operation codes, the following table reflects, in agreement with the view of the IEF and TWG and following the aim of the IPPC Directive, the type of waste operation codes that are covered in this BAT- document.

Consequently, the following fields are described in the BREF "Waste Treatments Industries":

- Physico-chemical treatment plants (CP-plants)
- Solvent recycling
- Mechanical-biological treatment plants (MBP)
- Replacement fuel processing (incl. sorting techniques)
- Slag processing
- Waste oil recycling

Sorting techniques are not considered an independent treatment process in this BREF but constitute a part of the field "auxiliary fuel processing". The described techniques, however, may also be applicable to other fields.

**Table 2** R- and D- Codes of the BREF „Waste Treatments Industries“

<b>Waste treatment processes according to Commission Decision 96/350/EC</b>	<b>R-/ D-Code</b>
Use principally as a fuel or other means to generate energy	R 1
Solvent reclamation/regeneration	R 2
Recycling/reclamation of other inorganic materials (i.e. others than the metals and metal compounds mentioned in R 4)	R 5
Regeneration of acids or bases	R 6
Recovery of components used for pollution abatement	R 7
Recovery of components from catalysts	R 8
Oil re-refining or other reuses of oil	R 9
Exchange of wastes for submission to any of the operations numbered R 1 to R 11	R 12
Storage of wastes pending any of the operations numbered R 1 to R 12 (excluding temporary storage, pending collection, on the site where it is produced)	R 13
Biological treatment not specified elsewhere in Annex II of the Decision 96/350/EC which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12	D 8
Physico-chemical treatment not specified elsewhere in Annex II of the Decision 96/350/EC which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.)	D 9
Blending or mixing prior to submission to any of the operations numbered D 1 to D 12	D 13
Repackaging prior to submission to any of the operations numbered D 1 to D 13	D 14
Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage, pending collection, on the site where it is produced)	D 15

The structure of the BREF "Waste Treatments Industries" corresponds to the prescribed basic structure of all BREFs:

- Chapter 1: General Information
- Chapter 2: Applied Processes and Techniques
- Chapter 3: Present Consumption and Emission Levels
- Chapter 4: Techniques to Consider in the Determination of BAT
- Chapter 5: Best available techniques
- Chapter 6: Emerging Techniques
- Chapter 7: Concluding Remarks
- Chapter 8: Annexes

For the users of the BREF "Waste Treatments Industries" the chapters 4 and 5 are of special importance. In chapter 4 already realized techniques are described which according to common opinion have the potential to reach a high protection level for the



environment. Chapter 5 mentions the consequentially best available techniques derived from chapter 4.

## 4 BAT for Sorting Techniques

Section 4.5.3 of this BREF describes the processing and sorting techniques that are currently used Europe-wide for the production of solid fuel from waste (see table 3). These techniques are applied for the production of fuel from hazardous and non-hazardous wastes. The techniques in the sections 4.5.3.1 to 4.5.3.5 are important for all kinds of wastes. The techniques in the sections 4.5.3.6 to 4.5.3.12 are mainly applicable to non-hazardous wastes. A technique especially for hazardous wastes can be found in section 4.5.3.13.

**Table 3** Processing and sorting techniques

<b>4.5.3</b>	<b>Techniques for the preparation of solid waste fuel</b>
4.5.3.1	Selection of techniques used for the preparation of solid waste fuel
4.5.3.2	Drying the solid waste fuel
4.5.3.3	Magnetic separation of ferrous metals
4.5.3.4	Separation of non-ferrous metals
4.5.3.5	All-metal separators
4.5.3.6	Positive and negative sorting
4.5.3.7	Use of pneumatic assistance for size reduction
4.5.3.8	Drum screens
4.5.3.9	Improvement of the dust filters in the cyclones of air classifiers
4.5.3.10	Near infrared spectroscopy (NIR)
4.5.3.11	Automatic picking
4.5.3.12	Pelletising and agglomeration
4.5.3.13	Cryogenic grinding

In chapter 4 of the BREF the techniques from table 3 are each displayed according to the following structure:

- description of the individual technique
- applicability of the process
- achieved environmental benefits
- cross-media effects
- driving force for implementation
- operational data
- example plants

Finally, chapter 5 of the BREF describes the general conclusions for BAT. At first, the general part illustrates the best available techniques of processes that are applicable to almost all waste treatments, such as environmental management, management systems, storage and handling of the wastes, exhaust gas treatment, sewage treatment, soil contaminations, and the management of process-generated residues. Achievable emission values are classified in "ranges of values" (e.g. emission ranges of values for sewage or exhaust gas). The specialized part of chapter 5 deals with selected processes for which specific limit values, reference conditions and costs are stated (e.g. limit values for emissions or consumption values).

For sorting techniques in connection with the processing of waste for the use as fuel the BREF contains only general instructions, such as:

The best available techniques consist in

- the visual evaluation of the incoming waste and the sorting of bulky metal or non-metal parts. The purpose of this measure is to protect the installation from mechanical damage,
- the use of magnetic separators for iron and separators for non-ferrous metals. The purpose of this measure is to protect the pelletizer and to comply with the demands of the end user,
- the application of the near infrared spectroscopy- (NIR-) technique for the sorting of plastics. The purpose of this measure is to reduce the concentration of organic chlorine and the content of metals as parts of the plastics.

## **5 Prospects for the BREF "Waste Treatments Industries"**

The COM accepted the TWG-document in August 2006 and published it in the Official Journal C of the EU [15]. The BREF is therefore generally available and supposed to be implemented by all Member States without any transition period. A translation of selected chapters into German was already prepared on behalf of the Federal Environment Agency but the English original remains exclusively legally binding.

Due to the upcoming Europe-wide formal execution and application of the BAT-document "Waste Treatments Industries", more experience and operational data from the Member States will be available in the future than was the case in the editing process of the now passed document. In a revision of the BAT-document more concrete and challenging demands may be formulated for the individual treatment processes. Apart from that, the inclusion of further treatment processes into the BREF could be investigated, depending on the individual exchange of information.

Until the revision of the BAT-document which is scheduled for 2009 a matching of the IPPC-Directive and the Directive on Waste should also be achieved so that for formal reasons unaccepted treatment processes, such as composting, may then be included in the BREF.

## 6 Further Reading

[1] Council Directive 96/61/EC concerning integrated pollution prevention and control of 24 Sept. 1996 (Official Journal L 257 p. 26), last amended on 18 Jan. 2006 (Official Journal L 33 p. 1).

[2] Ordinance on Installations Requiring a Permit (4. Ordinance on the Federal Immission Control Act – BImSchV) in the version of the promulgation of 14 Mar. 1997 (Federal Law Gazette. I p. 504), last amended on 15.7.2006 (FLG. I p. 1619).

[3] Act for Transposition of the Amended EIA- Directive, the IPPC-Directive and Other EC- Environmental Protection Directives ("Artikelgesetz") of 27 July 2001 (FLG. I p. 1950).

[4] Closed Substance Cycle Waste Management Act (Federal Recycling and Waste Management Act - KrW-/AbfG) of 27 Sept. 1994 (FLG. I p. 2705), last amended on 9 Dec. 2006 (FLG. I p. 2819).

[5] Act on the Prevention of Harmful Effects on the Environment caused by Air Pollution, Noise, Vibration and Similar Phenomena (Federal Immission Control Act - BImSchG) in the version of the promulgation of 26 Sept. 2002 (FLG. I p. 3830), last amended on 18 Dec. 2006 (FLG. I p. 3180).

[6] Act on Regulation of Matters Pertaining to Water (Federal Water Act - WHG) in the version of the promulgation of 19 Aug. 2002 (FLG. I p. 3245, last amended on 25 June 2005 (FLG. I P. 1746).

[7] First General Administrative Instruction for the Federal Immission Control Act (Technical Instructions on Air Quality Control - TA Luft) of 24 July 2002 (Joint Ministerial Gazette p. 511).

[8] Kalmbach, S.: Erläuterungen zur Technischen Anleitung zur Reinhaltung der Luft - TA Luft, 5. Auflage, Erich Schmidt Verlag, Berlin 2004.

[9] European Commission-DG Environment, „On the Road to Sustainable Production in the Enlarged EU“, 20-22 Sept. 2005 in Dresden, Conference Proceedings Umweltbundesamt Dessau, Dezember 2005.

[10], Reference document on the best available techniques for waste treatment plants with selected chapters in the German language (BAT-document)

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accessible on: [www.bvt.umweltbundesamt.de](http://www.bvt.umweltbundesamt.de).

[11] Council Directive 1999/31/EG on the landfill of waste of 26 Apr. 1999 (OJ. EC L 182 p.1), amended by Regulation (EC) of 29 Sept. 2003 (OJ. EU L 284 p.1).

[12] Council Directive 75/442/EEG on waste of 15 July 1975 (OJ. EC L 194 p. 39).

[13] Directive 2006/12/EG of the European Council and of the Council on Waste (consolidated version) of 5 Apr. 2006 (OJ. EU L 114 p. 9).

[14] Commission Decision 96/350/EG adapting Annexes II A and II B to Council Directive 75/442/EEG on Waste of 24 May 1996 (OJ. EC L 135 p. 32).

[15] European IPPC Bureau, Seville, Reference Document on Best available techniques for the Waste Treatments Industries, August 2006,  
Passing promulgated in OJ. EU C 257 p. 15 of 25 Oct. 2006.

### **Author's Address**

Dipl.- Ing. Siegfried Kalmbach

Umweltbundesamt

Postfach 1406

06813 Dessau

Phone: +49 340 2103 3637

Email: [siegfried.kalmbach@uba.de](mailto:siegfried.kalmbach@uba.de)