

**Coordinating European Strategies on Sustainable Materials,
Processes and Emerging Technologies Development in Chemical Process
and Water Industry across Technology Platforms**

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1. Introduction

The aim of work-package 5.3 was to set-up a discussion with European and national ‘best available techniques’ (BAT) input groups on how different sectors and technology areas cope with innovation introduction into BREF documents (BREF = European BAT Reference Documents). The question here is whether and how BREF can speed-up the innovation uptake in companies.

BREFs are set up by the IPPC-office of the IPTS research center (IPTS = Institute for Prospective Technological Studies) as part of the European IED Directive. These BREFs give an overview of what BAT are and which environmental accomplishments can be achieved with BAT. Studies are established in a process where industry, Commission, member states and other stakeholders play a role.

2. BREF and related bodies

2.1. BREF panel

The term Best Available Techniques (or BAT) is an important concept in the environmental permit policy for companies. BAT are techniques and organizational measures that get the best marks as far as the environment is concerned. This all happens under technical and economical achievable circumstances.

A new important part of the BREFs are the BAT conclusions. This was introduced at the same time that the industrial emission guideline was launched, replacing the former IPPC-directive. It concerns the conclusions about the Best Available Techniques. Here you will find, among other things, a description of the Best Available Techniques, associated emission levels and the monitoring that goes along with it. As a result, these BAT conclusions are the reference in setting up permit conditions for emissions and discharges.

2.2. Industrial emission guideline - Directive 2010/75/EU

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:334:0017:0119:en:PDF>

2.2.1. Context

The European Union (EU) defines the obligations to be met by industrial activities with a significant pollution potential (**Directive 2010/75/EU of the European parliament and of the council of 24th November 2010 on industrial emissions**). This directive brings together directive 2008/1/EC (IPPC directive) and six other directives in a single directive on industrial emissions. It establishes a permit procedure and lays down requirements, in particular with regard to discharges. The objective is to avoid or minimize polluting emissions in the atmosphere, water and soil, as well as waste from industrial and agricultural installations, with the aim of achieving a high level of environmental and health protection.

2.2.2. Sectors of activity

The Directive covers industrial activities with a significant pollution potential (around 50 000 of these installations in Europe), defined in Annex I to the Directive (energy industries, production and processing of metals, mineral industry, chemical industry, waste management, rearing of animals, etc.).

The Directive contains special provisions for the following installations:

- combustion plants (≥ 50 MW);
- waste incineration or co-incineration plants;
- certain installations and activities using organic solvents;

- installations producing titanium dioxide.

This Directive shall not apply to research activities, development activities or the testing of new products and processes.

2.2.3. Environmental requirements

Any industrial installation which carries out the activities listed in Annex I to the Directive must meet certain basic obligations:

- preventive measures are taken against pollution;
- **the best available techniques (BAT) are applied;**
- no significant pollution is caused;
- waste is reduced, recycled or disposed of in the manner which creates least pollution;
- energy efficiency is maximised;
- accidents are prevented and their impact limited;
- sites are remediated when the activities come to an end.

2.2.4. Application of best available techniques

Industrial installations must use the best available techniques to achieve a high general level of protection of the environment as a whole, which are developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions. The European Commission must adopt BAT conclusions based on the emission levels associated with the BAT. These conclusions shall serve as a reference for the drawing up of permit conditions.

2.2.5. Emerging techniques

Member States shall, where appropriate, encourage the development and application of emerging techniques, in particular for those emerging techniques identified in BAT reference documents. Furthermore, the Commission shall establish guidance to assist Member States in encouraging the development and application of emerging techniques as referred to in paragraph 1.

2.2.6. Permit conditions

The permit must provide for the necessary measures to ensure compliance with the operator's basic obligations and environmental quality standards. These measures shall comprise at least:

- emission limit values for polluting substances;
- rules guaranteeing protection of soil, water and air;
- waste monitoring and management measures;
- requirements concerning emission measurement methodology, frequency and evaluation procedure;
- an obligation to inform the competent authority of the results of monitoring, at least annually;
- requirements concerning the maintenance and surveillance of soil and groundwater;
- measures relating to exceptional circumstances (leaks, malfunctions, momentary or definitive stoppages, etc.);
- provisions on the minimization of long-distance or transboundary pollution;
- conditions for assessing compliance with the emission limit values.

2.3. European IPPC bureau (<http://eippcb.jrc.es/>)

The European IPPC Bureau is an action of the Sustainable Production and Consumption Unit of the Institute for Prospective Technological Studies (IPTS). The IPTS is one of the seven scientific institutes of the European Commission's Joint Research Centre (JRC).

The European Integrated Pollution Prevention and Control (IPPC) Bureau (EIPPCB) was set up in 1997 to organize an exchange of information between Member States and industry on Best Available Techniques (BAT), associated monitoring and developments in them.

With the entry into force of the Industrial Emissions Directive (2010/75/EU), the EIPPCB organizes and coordinates the exchange of information that leads to the drawing up and review of BAT reference documents according to the dispositions of the Guidance document on the exchange of information (Commission Implementing Decision 2012/119/EU). The European IPPC Bureau is an output oriented team which produces reference documents on Best Available Techniques.

In the international context, the European information exchange on best available techniques is considered to be an EU contribution to the global process initiated in 2002 at the World Summit on Sustainable Development so that non-EU countries can also reap the benefits of this ambitious work.

3. Guidance for setting up BREF

3.1. Directive

Commission implementing decision of 10th February (2012 2012/119/EU) laying down rules concerning guidance of data and on the drawing up of BAT reference documents and on their quality assurance referred to in Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions.

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:063:0001:0039:EN:PDF>

3.2. Included detailed definitions in this guidance document:

A **best available techniques (BAT) reference document (BREF)**, resulting from this exchange of information, is defined in Article 3(11) of Directive 2010/75/EU. It is a document drawn up for defined activities describing, in particular, applied techniques, present emission and consumption levels, techniques considered for the determination of BAT as well as BAT conclusions and any emerging techniques, giving special consideration to the criteria listed in Annex III to Directive 2010/75/EU. Therefore, by definition, a BREF is a descriptive document and it does not prescribe the use of any technique or specific technology, nor does it interpret Directive 2010/75/EU.

Best available techniques (BAT) are defined in Article 3(10) of Directive 2010/75/EU as the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

- (a) 'techniques' includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- (b) 'available techniques' means 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;
- (c) 'best' means most effective in achieving a high general level of protection of the environment as a whole.

Article 3(12) of Directive 2010/75/EU also defines '**BAT conclusions**' as the parts of a BREF laying down the conclusions on BAT, their description, information to assess their applicability, the emission levels associated with the BAT, associated monitoring, associated consumption levels and, where

appropriate, relevant site remediation measures. The BAT conclusions are to be adopted through the procedure referred to in Article 75(2) of Directive 2010/75/EU. They shall be the reference for setting permit conditions for the installations covered by Directive 2010/75/EU.

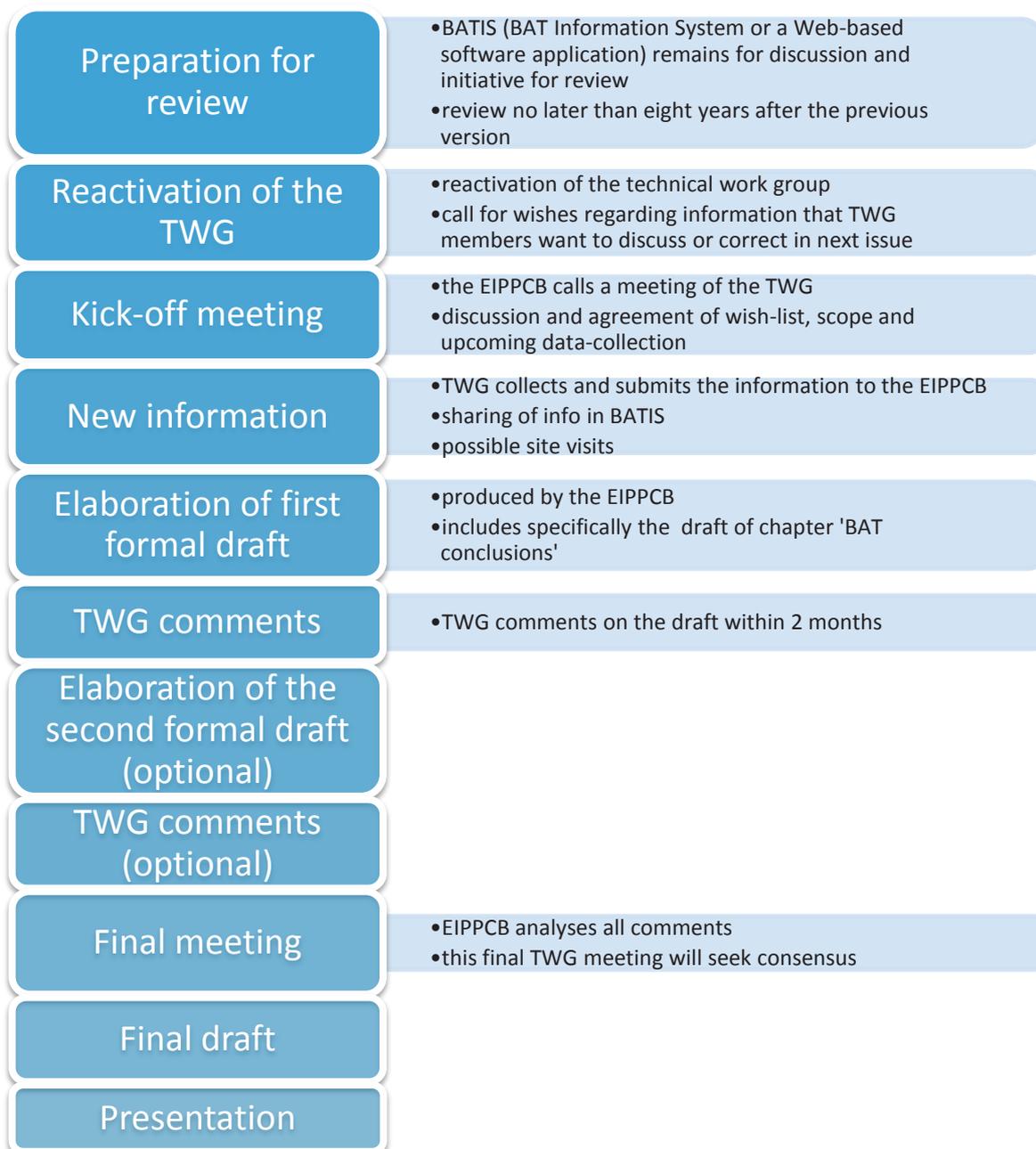
For the drawing up or reviewing of a BREF document, a **TWG** (Technical Working group) is set up (or re-activated) by the Commission. Each TWG consists of technical experts representing Member States, industries, non-governmental organisations (NGOs) promoting environmental protection and the Commission. TWG members are nominated to participate in the information exchange primarily based on their technical, economic, environmental or regulatory expertise.

3.3. Aim of BREF as described in this guidance document

The aim of a BREF is to determine BAT and BAT-conclusions and to limit imbalances in the Union as regards the level of emissions from industrial activities. BREFs should provide information to the competent authorities of Member States, industrial operators, the Commission and the public at large on what BAT and emerging techniques are for the activities covered by Directive 2010/75/EU. The process of determining BAT and emerging techniques should be transparent and objective, based on sound technical and economic information. A BREF should also serve as a driver towards improved environmental performance across the Union.

3.4. Main steps for the drawing up and reviewing of a BREF

The following overview provides the main steps in the drawing up and reviewing of a BREF.



3.5. BREF contents and scope

Preface	<ul style="list-style-type: none"> • standard section
Scope	<ul style="list-style-type: none"> • activities covered by the specific BREF
Chapter 1: General information on sector	<ul style="list-style-type: none"> • general information about the industry sector concerned
Chapter 2: Applied processes and techniques	<ul style="list-style-type: none"> • this chapter reflects the sequential steps in a typical manufacturing unit
Chapter 3: Current emissions and consumption levels	<ul style="list-style-type: none"> • for the overall process and its sub-processes
Chapter 4: Techniques to consider as BAT	<ul style="list-style-type: none"> • a catalogue of techniques and associated monitoring • description in a concise way
Chapter 5: Best available techniques conclusions	<ul style="list-style-type: none"> • see definition of BAT-conclusions above
Chapter 6: Emerging techniques	<ul style="list-style-type: none"> • novel techniques for an activity that, if commercially developed, could provide either a higher general level of protection and/or cost saving for the environment • only techniques to be included that are at a sufficiently advanced stage of development
Concluding remarks	
References	
Glossary	
Annexes	

4. Discussions with stakeholders and actors related to BAT creation and use

4.1. BAT-knowledge center

During a first discussion with the Flemish BBT-knowledge center some general remarks on the BREF and its procedures were noted:

- BREFs are set-up in technical working groups that include industry representatives, technical experts representing member states, NGO's promoting environmental protection,... The aim of the technical working group is to exchange information and to reach consensus on the BAT conclusions. BAT are the basis for environmental permits, so any installation as defined in the industrial emission guideline will have to apply BAT, and this requires additional investments. Therefore, some industrial stakeholders possibly take a rather conservative position and information on innovative techniques will not always be shared. As stated in paragraph 3, BREFs aim at limiting imbalances in the Union. This implies however that the outcome does not really represent a list of high-end innovative techniques, but rather techniques that are judged to be (technically and economically) 'available' to all installations.
- Techniques can be split into three groups:
 - those that are already commonly applied in industry
 - those that are occasionally applied in industry (these techniques are typically the subject of discussion in the technical work groups whether or not to include as BAT).
 - the most innovative techniques. These are in the BREF included in the 'chapter 6' on emerging technologies.
- The emerging technologies are discussed as well in the TWG. As BREFs mainly focuses on the BAT and the BAT-conclusions, chapter 6 with the emerging technologies might be less elaborated in some BREFs. In order to improve the innovative character of 'chapter 6' a solution could be to separate the discussion on the emerging technologies and bring it to a different level. A specific, more scientific work group could act than more focused and elaborate on this topic.

4.2. Discussion with Cefic regulatory department - view from industry

To compile the view of industry, VITO set up a discussion with CEFIC in June 2013.

Present from CEFIC:

- Ann Dierckx
- Antonia Morales
- Giovanna Zamburlini
- Bernd Sojka

Present from VITO:

- Wim Schiettecatte
- Inge Genné

The conclusion of the meeting was that according to CEFIC, reflecting the opinion of its member companies, the Seville process – and BREF tool in particular - is not seen as the most suitable forum for pushing technology innovations to be taken up by industry.

The main reason for this is linked to the fact that the output of the Seville process bears immediate consequences; influencing the permit and the operational costs.

Secondly, a general comment is related to the decision making process in industries related to the introduction of any innovation. The eagerness/willingness to innovation is present in the genes of the chemical industry, and the uptake of innovations – either as a result of own research or third party research – is not driven by a mentioning of a technology as emerging for the sector but is driven by the quality of the business case the innovation represents. This takes into account a variety of factors: operational risks, costs, fast mover advantages,... Most innovations are resulting from an intelligent combination of technologies or from an innovative approach, even using existing technologies.

Other forums to enhance further uptake of research results and break-through concepts are believed to be more suitable; the example given, that really is seen as a multiplier factor, is the setting up of dedicated pilots and open, visible demonstration plants. Another example is the broad availability of technological information on open fora like e.g. Wikipedia. This is seen very valuable as one of the first contact means to gather new information around so-called emerging technologies.

To speed up and facilitate the innovation process it is seen as very important that governments, industry and knowledge centres work together to stimulate and really focus on innovative approaches which are supported by good industrial business cases. The “integrated thinking” concept is considered as very important to have a common denominator between all stakeholders.

4.3. Input from EMH – view from technology providers

The European membrane House (EMH) originates from the Network of Excellence Nanomempro. During the preparation process of their Strategic Business and research agenda, several workshops were organized to set up interactive discussions with industrial stakeholders. The process was led by Prof. Gilbert Rios and the consultancy company ALCIMED. One of the topics was focused on “Membranes as Best available technologies for environmental issues”.

The industrial participants were representatives from chemical/membrane production companies, membrane technology providers and environmental companies.

In this workshop, following questions were raised by the moderators:

- Practical experiences with IPPC regulation
- Is BAT recognition seen as ‘a great opportunity’ for industrialists?
- Is BAT a driver for innovation?
- Are there sectors that need a better representation in the establishing bodies?

The participants first noticed that ‘Best available technologies’ reference documents do not include any new technology but are based on state-of –the art ones.

Also there is a strong believe that industrialists have discussed together in order to put in BAT documents only common and standard technologies. They agreed on the fact that some industries need those BREFs whilst other sectors already strongly consider environmental issues and will pursue factory adaptation on their own. For instance the pulp and paper industry, they follow BREF but it’s what they would have done anyway. BREF is not considered as an innovation-stimulator.

Based on their experience in the setting up of dedicated Erasmus Mundus and PhD programmes, EMH stresses as well that good oriented education should be seen as the way to implement innovative new products, technologies, concepts, ... on the long term.

4.4. Discussion with Veolia's Environmental Research and Innovation department

Veolia has been involved occasionally in some BREF redaction as, for example, the one concerning "Common wastewater and waste gas treatment / management systems in the chemical sector", only for some specific technologies (e.g. Membranes bioreactor).

Veolia doesn't have a pre-defined internal strategy for being implied in the BREF redaction. In the future it could be positive for the BAT concept to include a more elaborated part dedicated to innovative or new technology even if those are not yet industrially implemented or widespread. Indeed it can be an issue if, as an example, a call for tender doesn't open to new solutions which are better than the official BAT.

The BAT, in opposite, could be a good opportunity to promote the market innovative technologies currently under development.

5. Conclusions and further points of discussion

As a main outcome of the discussions it became clear that BAT documents play an important role in setting high standards for the industry, but still feasible on a technical and economical level. The aim is as well to level these standards for the whole European Union, being a wide implementation area with industry at different levels of refinement.

The question remains how innovation uptake in companies can be speed up. Other channels besides BREFs might be more logic and efficient. The following comments and ideas can be used to support further discussion:

- Create 'toolboxes' that provide a path to follow and will guide industry in the implementation of innovation.
- Stimulate national research centers in supporting local industry in their innovative developments.
- Demonstrate technologies by means of pilot.
- Convince companies of the importance on innovation on a level of product improvement, cost reductions, environmental benefits,... Underline the importance of LCA, besides technical and economical studies, to get a wider view on the advantage.
- Get the introduction and description of innovative technologies into 'Wikipedia'.
- Good oriented education should be seen as the way to implement innovative new products, technologies, concepts, ... on the long term.