Texte
16
00
ISSN
0722-
186X

European Conference

The Sevilla process: A driver for environmental performance in industry

Stuttgart, 6-7 April 2000

Proceedings

Table of Contents

Acknowledgements

The conference was jointly sponsored by the European Commission, the German Ministry for the Environment, Nature Conservation and Nuclear Safety and the Ministry of the Environment and Transport of the State of Baden-Württemberg, and organised by the Federal Environmental Agency.

We would like to acknowledge the scientific and organisational support of ecologic gGmbH, and the organisational support of the Landesbank Baden-Württemberg.

The Federal Environmental Agency wishes to thank the representatives of the European IPPC Bureau for the good co-operation, and all speakers for their support and contributions to the conference.

We are very grateful to the chairpersons of the several sessions and, last but not least, to all participants for their contributions which made the conference a place for very interesting discussions. We apologise to those who could not participate in the conference because it was fully booked, and hope that these conference proceedings will give them and all other interested people a good overview of the conference.

Introduction and Summary of Discussion

Almut Reichel,
Federal Environmental Agency, Germany

The context

The IPPC Directive sets forth ambitious objectives. The fundamental aim is to achieve a high level of protection of the environment as a whole by preventing or reducing the pollution emanating from industrial installations directly at source. A key element of the Directive is the use of best available techniques, BAT for short.

Article 16(2) of the Directive requires the European Commission to organise an exchange of information between Member States and the industries concerned on BAT, associated monitoring and developments in them, and to publish the results. The purpose of this information exchange is to redress technological imbalances in the Community, to promote the world-wide dissemination of limit values and techniques used in the Community and to assist the Member States in the efficient implementation of the Directive.

The Commission has established an information exchange forum and a number of technical working groups to assist in the work. These activities are co-ordinated by the European IPPC Bureau at the EU Joint Research Centre in Seville (Spain), and they have been divided into some 30 sectors along the lines of Annex I of the Directive. For each sector, the results of the information exchange are laid down in so-called BAT reference documents (BREFs).

Purpose of the Conference

The aim of the conference "The Sevilla Process: A driver for environmental performance in industry" was to inform about this information exchange process ("Sevilla Process"). It was intended to promote the implementation of the Directive and demonstrate the increased application of environmentally advanced techniques in Europe.

The Conference

More than 450 participants from 25 European countries – including the accession countries – representing authorities as well as industry, technical development institutions and environmental NGOs attended the conference, which was held on 6 and 7 April 2000 in Stuttgart.

The two days were structured around four main sessions: First, key actors of the Sevilla process presented their views and expectations on the process. Then, the background and aims of the IPPC Directive and the Sevilla process as well as the experience gained so far in the information exchange process were presented, followed by an explanation of the concept of the BREFs and the work of the European IPPC Bureau. As an important part of the conference, the following session was devoted to several BREF authors reporting on the content and structure of BREFs and demonstrating ways to overcome conflicts and difficulties, based on a number of examples from the current work on BREFs.

The second day concentrated on the presentation of approaches to the implementation of the IPPC Directive and the intended use of the BREFs in several Member States, including a pilot project in an accession country (by the way, the selection of presentations does not mean that the other Member States' concepts are less interesting, but time did not allow to present more). In the concluding panel discussion important aspects discussed at the conference were highlighted and conclusions drawn from the Sevilla process and the conference.

Summary of important points of debate and conclusions from the panel discussion

The conference showed that there is considerable commitment to the Sevilla process on the part of the Member States as well as in industry and environmental NGOs. Due to this commitment and the three years of experience with the drafting of BREFs the Sevilla process is now well on its way. However, there are still some general questions to work on, e.g. how exactly to deal with cross media and economic aspects in the determination of BAT.

As the Member States had to bring their national legislation into line with the IPPC Directive by the end of October 1999, at present the main focus of interest is shifting to the question of how the Member States are going to use the BREFs in their national permitting systems. The presentations showed that while most Member States are going to retain their current national concepts they will improve and adapt them to reflect the provisions of the IPPC Directive and the BREFs.

During the panel discussion, the IPPC Directive was identified as a core element of EU environmental policy. The flexible approach of the BREFs, being a dynamic and readily available instrument, was welcomed but some worries were also expressed as to the extent to which this approach would be able to bring about a high level harmonisation of environmental standards in industry in the long run, bearing in mind the differences in the implementation of the BAT concept in the Member States as presented at the conference.

It became clear that at the moment, no conclusive statement can be made about the success of this approach. The European Commission assured that it would follow the implementation of the IPPC Directive and application of the BREFs in the Member States and indicated that it was planning a review of the process by the year of 2004. It was clearly said that even if the BREFs are not directly legally binding, good reasons would need to be presented for using less demanding requirements than the best available techniques and associated emission and consumption levels as presented in the BREFs.

In general, the BREFs were acknowledged as high quality documents, and the Member States were encouraged to use them not only in the framework of IPPC but also to actively disseminate and use them internationally, as the 'voice of Europe on BAT', e.g. in the framework of OSPAR, HELCOM or UNECE.

An important point of debate was the question of who should bear the burden of proof in assessing whether a technique is too expensive to be BAT. It was suggested that the Information Exchange Forum (IEF) draw up guidelines on how to deal with this question because up to now there is no joint toolbox for undertaking such an assessment. However, it was clearly stated by several speakers that those asserting that a technique is too expensive should provide good arguments and reliable facts to justify this claim.

Concerning possibilities for improving the Sevilla process, the representatives of the EIPPCB and the European Commission encouraged all parties involved to meet their responsibility for providing sound data as input to the information exchange. The representative of industry (Union of industrial and employers' confederations of Europe, UNICE) stressed the intensive engagement of industry so far in spite of industry's fears that it would suffer disadvantages from the process. He recommended more plant visits as well as a third TWG meeting in order be able to discuss important issues in more detail.

The representative of the European Environmental Bureau (EEB) criticized the structural under-representation of environmental NGOs due to insufficient funds as well as an under-representation of equipment suppliers and „fore-runners" in industry in the process, and called for clear rules of decision-making in case of non-consensus. Furthermore, he asked the EIPPCB for a more transparent handling of the comments. The EIPPCB's representative explained that the Bureau is unable to respond to every single comment due to the sheer amount of comments but assured that all comments are taken into account by the EIPPCB. Responding to a question from Lithuania, he referred to the task of the EIPPCB to answer questions of the accession countries concerning IPPC and BAT.

Based on the German experience that clear-cut emission limit values trigger research and development activities in industry, the representative of the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) pointed out that the possibility of Community emission limit values pursuant to Article 18 of the Directive should not be entirely foregotten.

The proper implementation and full use of the BREFs in all Member States was questioned in the light of the fact that only parts of the BREFs, mainly the executive summaries, will be translated into all official languages of the EU. Responding to several calls for a full translation, the representative of DG Environment explained that the Commission has no resources for full translations, especially as the number of languages increases with the extension of the European Union.

In order to offer a forum for the repeatedly-mentioned intermediate evaluation of IPPC and the Sevilla process after some years of experience and implementation, the German Ministry for the Environment, Nature Conservation and Nuclear Safety proposed to organise a follow-up conference in 2004, then with special attention to the accession countries.

Session I:
Welcome and Introduction

1.1 Introduction and Welcome

Prof. Dr. Andreas Troge,
Federal Environmental Agency, Germany

- The spoken version is the official text –

Ladies and Gentlemen,

I am pleased to welcome you to this conference on the Sevilla process and the IPPC Directive. I would particularly like to welcome the representatives of the European Commission, the Federal Ministry for the Environment and the Ministry of the Environment and Transport of the State of Baden-Württemberg, which have provided the necessary financial support to make this conference possible.

I would also like to thank the European IPPC Bureau in Seville, above all for the good cooperation in designing the technical programme of this conference, as well as ecologic for the productive cooperation in preparing it. Finally, my thanks also go to the speakers for their participation and contributions.

This conference is taking place at the right time: The first BAT Reference Documents (BREFs) have been finalised and the IPPC Directive is now being implemented step by step. That you have come to this conference in such large numbers shows once more how important it is that we now broadly inform about and discuss the Seville process.

Ladies and Gentlemen,

the last several years have seen considerable progress in the reduction of pollutant emissions to the environment. A high technical standard in pollution abatement has been achieved in many sectors, both here in Germany and in other Member States of the European Union. Nonetheless, a large contribution to total pollutant emissions is still being made, in particular, by the industrial activities covered by the IPPC Directive. The need for a further reduction of these emissions is evident, firstly, by the extent to which actual pollution levels in large parts of Europe fall short of the environmental quality standards laid down in the European Environmental Quality Directives and, secondly, by the deviations from the "critical loads" and "critical levels" established by the UN ECE. The goal of sustainable industrial production in Europe has not yet been achieved.

Ambitious objectives have been set by the IPPC Directive. The fundamental objective is to achieve a high level of protection of the environment as a whole by preventing or reducing the pollution emanating from industrial installations directly at source. This is to be done on the basis of an integrated approach which encompasses all environmental media. The central element of this approach is the use of the best available techniques, BAT for short.

Ladies and Gentlemen,

The Sevilla process plays a key role in activities to this end. The exchange of information on best available techniques is designed to support Member States and industry in effectively implementing this integrated approach. This information exchange is reliant on the factual power of knowledge. It serves as an instrument to equalise the technological imbalances that exist within the European Union and to harmonise at a high level the environmental requirements imposed on the operation of industrial installations. I continue to

adhere to the view that this does not overtax industry. It is a challenge and an opportunity for modernising and increasing the efficiency of processes and production through environmental protection measures.

The groundwork for making the BREFs become heard world-wide as the "voice of Europe" on best available techniques has also been laid. Firstly, everybody interested in the BREFs can easily gain access to them via the Internet. Secondly, for the first time ever, comprehensive, cross-media information on best available techniques is being made available for all major industrial sectors according to a uniform format. This allows external parties – in and far beyond Europe – to obtain clear guidance.

Ladies and Gentlemen,

The in-depth discussions and debates in the Technical Working Groups have shown that the elaboration of BREFs is a very difficult process. Even when viewed against the complexity of this task, the BREFs now available are of notable quality.

We must now see to it that the IPPC Directive and the BREFs are implemented broadly and quickly. In spite of the use of different implementation approaches, some of which are going to be presented tomorrow, the outcome should always be the same:

- first, a high level of protection of the environment as a whole through the use of best available techniques as described in the BREFs, and
- second, a harmonisation of environmental requirements on all industrial installations at a high level.

What the citizens of Europe expect most of all is an improvement of the quality of their environment.

Ladies and Gentlemen,

We, on the German side, will continue to actively participate in the Sevilla process. As National Focal Point for Germany, the Federal Environmental Agency will continue to vigorously support and promote the exchange of information on BAT. This conference, which I expect to produce animated discussions, is a contribution to that exchange.

1.2 Welcome and Introduction

Stefan Mappus

**Ministry of the of the Environment and Transport
of the State of Baden-Wuerttemberg**

- check against delivery. -

Ladies and Gentlemen,

On behalf of the state government of Baden-Wuerttemberg, I extend to you a heartfelt welcome to Stuttgart for this conference concerning the development of the "Best Available Techniques" in accordance with the IPPC Directive. It is a special pleasure for me to have the opportunity to welcome here today the representatives of the European Commission, the German Federal Ministry for the Environment and the Federal Environmental Agency as well as the visitors from the member states of the European Union and from the neighboring countries.

For the state of Baden-Wuerttemberg and for the state capital, Stuttgart, it is a special honor that you have selected Stuttgart as the location for this important European conference. We will make an effort to ensure that the two work-filled days in Stuttgart are as pleasant for you as possible. We have already done a first step to this end by selecting the Forum in the Baden-Wuerttemberg State Bank as the venue for the conference. Due to its situation right in the center of the city, you have easy access to all means of transport, to your hotels and for an evening in the city. At this point I would like extend my heartfelt thanks to the Baden-Wuerttemberg State Bank and to the chairman of its board of directors, Mr. Werner Schmidt, for the support in the preparation of the conference. Mr. Schmidt will greet you tomorrow morning, in his function as host.

Ladies and Gentlemen, there is another reason that Stuttgart is a good choice as a location for a conference on the prevention and control of emissions from industrial plants.

With a population of approx. 2.5 million in an area 3700 square kilometers in size, the Stuttgart metropolitan area is among the most densely populated and highly industrialized regions in Europe. A number of global companies have their headquarters here and, together with a diversity of medium-sized businesses, characterize the economy in the southwestern part of Germany.

Due to its topographic location, in a valley with poor air circulation and a sensitive aquatic ecosystem, emissions from industrial plants caused considerable environmental problems in the Stuttgart area in the 1970s and 1980s, as the region became more and more industrialized.

Through governmental action and due to the efforts of industry, this development could be countered and remarkable successes could be achieved, particularly with regard to air pollution control, the quality of river waters and waste management. Even if so far we do not yet have integrated, cross-media environmental legislation in Germany, we nevertheless were able to reduce the input of pollutants into air and water through the consistent application of the emission principle, i.e. use of modern environmental technology and continual further development of the State of the Art. Through rapid and consistent retrofitting of existing installations, the installation of flue gas desulfurization and denoxing systems at power stations and the use of low-sulfur fuels, emissions of the classical air pollutants sulfur dioxide, carbon monoxide and particulate matter were reduced and air quality was

considerably improved. The emissions of the indicator pollutant sulfur dioxide were reduced in Baden-Wuerttemberg from 330,000 tons per year in 1973 to approximately 60,000 tons per year in 1995. In the past few years immission levels in smog areas have been at a maximum 40 % of the warning level values- with a downward trend. Against the background of this development, the winter smog ordinance of the state was rescinded at the end of 1996.

The biological-ecological quality of flowing waters has improved, as well. The target of the state government is that all watercourses exhibit at least water quality class II ("moderately polluted"). In 1974, this quality target was achieved at approx. 41% of the monitoring stations. That share could be increased to approx. 76% by 1998. Today, a serious pollution problem exists at only 3% of the river sections. The continuous improvement of water quality can be mainly attributed to the expansion of sewage treatment plants. Today, about 96% of the population is connected to modern mechanical-biological sewage treatment plants. The pollution of the waters by hazardous substances has also decreased significantly; for example, the heavy metal pollution of the Neckar river has fallen by up to 90% since the seventies. Basically this can be put down to the treatment of the specific waste water from industrial activities.

However, in spite of all successes, problems still exist in the fields addressed. With regard to air pollution, this applies particularly to volatile organic compounds(VOC), which include toxic and carcinogenic components (key word: benzene) and, together with nitrous oxides, contribute to the formation of ground-level ozone, as well as, increasingly, to fine particles emissions. Also, considerable need for action still exists as regards the pollution of waters by hazardous substances, e.g. chlorinated organic compounds, persistent organic pollutants and accumulative substances.

Ladies and gentlemen,

Achieving the IPPC Directive's objective of integrated pollution prevention and control through the uniform application of BAT Europe-wide, is a very challenging task. Baden-Wuerttemberg has already provided sustained support for the work on BAT in its initial phase and will continue to do so in the coming years, with provision of experience and expertise. At the same time I regard this information exchange as a good chance for our industry and our licencing authorities to learn from the experience gained in other countries. Our target must be to achieve a further overall improvement in environmental quality by using efficient, innovative processes and technologies.

In this sense I wish this conference much success and call on you all to contribute to an intensive and cooperative exchange of ideas during these two days in Stuttgart.

1.3 Introduction – The IPPC Directive

Herbert Aichinger,
Environment Directorate-General,
European Commission

Preparations for the IPPC Directive (96/61/EC)[1] started early in the 1990s and the European Community's Fifth Environmental Action Programme, adopted in 1993, stated that one of its objectives was "improved management and control of production processes including a system of licensing linked to integrated pollution prevention and control". The Directive was adopted in 1996 and came into effect in October last year. This means that the European Commission has two major tasks to carry out: first to check that the Directive is correctly transposed into national legislation and second to promote and verify appropriate application of the rules laid down in the Directive. Organising the exchange of information on best available techniques (BAT) and following how the EU Member States use the BREFs (BAT reference documents) in their permit systems are crucial parts of the second task. Therefore, the European Commission has a great interest in supporting this conference, since it will raise awareness of both the information exchange process and the planned use of BREFs in various countries of the European Union.

In recent years, EU environmental policy has evolved from a traditional, command-and-control approach towards a more integrated and flexible approach. At EU level, we now use at least three different instruments to tackle pollution caused by point sources:

- Prescriptive legislation containing minimum rules to be applied uniformly across the Union (e.g. the Large Combustion Plants Directive).
- Flexible legislation imposing additional site-specific or national rules, which will vary from one installation to another within the Union (e.g. the IPPC Directive).
- Voluntary and/or market-based instruments setting the basic rules for operators who want to exploit market opportunities (e.g. the EMAS regulation and a future emissions trading scheme).

Another important piece in this jigsaw puzzle is the introduction of EU-wide environmental quality standards established through the air and water directives. The quality standards provide the framework for both minimum emission limit values and additional BAT-based conditions. If the use of BAT is not enough to meet a quality standard, then more drastic measures must be taken.

The IPPC Directive is an important milestone in this evolution, because it sets a flexible and integrated framework for the environmental regulation of a wide range of the most polluting industrial activities. A problem with previous legislation was the lack of flexibility, in which specific measures were prescribed by the regulators irrespective of whether they represented the best solution in particular circumstances. Inflexibility often results from, and contributes to, a climate of distrust and confrontation between industry and the environmental regulators.

The 21st century should not be characterised by fights between regulators and companies. With sustainable development as its long-term goal and with a firm

[1] http://europa.eu.int/comm/environment/ippc/index.htm

focus on the principle of shared responsibility, the fifth environmental action programme sent a strong signal that the days of confrontation were over and that the time had come to start a real dialogue with industry and to raise its sense of responsibility for protecting our common environment and contributing to sustainable development.

The IPPC Directive takes an integrated approach, which means that authorities need to weigh up non-local and transboundary effects, such as global warming and acidification, against effects on the local environment. They also need to take into account the costs, as well as the advantages, of pollution prevention and control, and make sure that they are up to date with the latest developments in best available techniques.

This important obligation has lead to the establishment of the EU-wide exchange of information on BAT. The Sevilla Process offers both good value for money for all parties involved and favourable conditions for the convergence of permit requirements across the Union.

It is worth noting that although the IPPC Directive from a legal point of view is a purely environmental directive, it certainly contributes to several other goals of the European Union:

?? Promotion of innovation. By introducing a benchmarking system, the directive stimulates systematic modernisation of European industry, through the implementation of both high-tech production equipment and cleaner operational practices.

?? Economic and social cohesion. The Union should not tolerate some of its member countries having mainly old and polluting production, while the others have modern and "clean" production. The Directive will counteract such tendencies and promote structural transformation of the business world in all EU countries.

?? Fair competition on the Internal Market. By laying down harmonised framework rules for the most polluting installations in the EU, the Directive will reduce the risk of market distortions through environmental dumping and create a more level playing field for business in the EU.

A prerequisite for sustainable development is the active participation of ordinary citizens in the environmental debate. To inform and involve citizens is consequently a high-priority issue for the European Commission. Ensuring public access to various documents is central to the IPPC Directive; permit applications, permit decisions and monitoring reports must be made available to the public. Of course, the BREFs will also be publicly available, thus facilitating comparison and scrutiny of permit conditions. For this purpose, the EU Member States and the European Commission are also establishing an inventory of the major polluting sites in the EU (the European Pollutant Emission Register)[2].

[2] http://europa.eu.int/comm/environment/ippc/eper.htm

One extra hot issue in today's environmental policy debate is climate change. Something that could have quite far reaching implications for the IPPC permitting system is the possible introduction of a Community wide scheme for trading with CO_2 (and other greenhouse gases) between companies. In the relatively near future, carbon dioxide could be excluded from the scope of the permit systems, provided that the company participates in emissions trading. Alternatively, a combination of these two instruments could be envisaged. When deciding which way to go, the Community will base its decision on an analysis of the effectiveness of each option, both in terms of lower emissions and in terms of cost-effectiveness. The European Commission has recently published a Green Paper on greenhouse gas emissions trading within the EU[3] and we look forward to receiving comments on this.

Hopefully, this conference will contribute to the principal objective of the Directive, i.e. that all industrial operators improve the management and control of their production processes – by applying best available techniques – in order to achieve the highest level of environmental protection that is consistent with a competitive industry in the European Union.

[3] http://europa.eu.int/comm/environment/docum/0087_en.htm

Session II: Expectations of Various Sides of IPPC and BAT

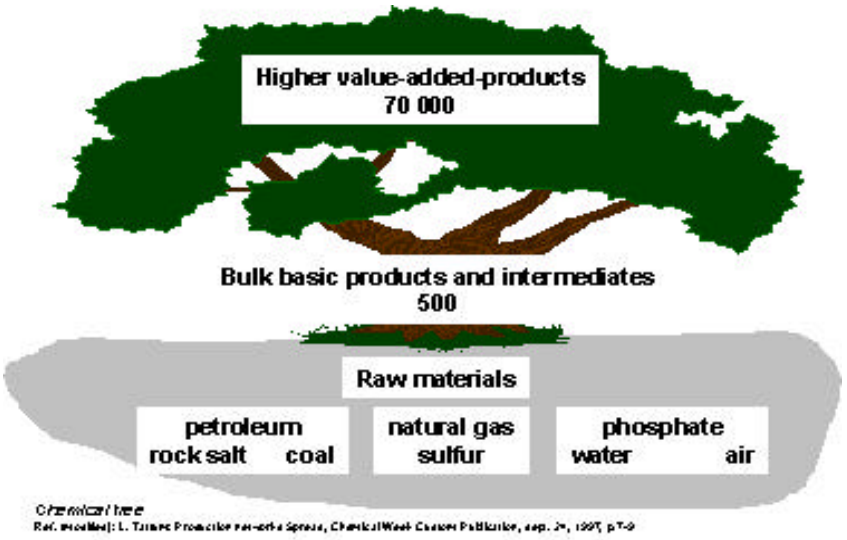
2.1 Expectations of the chemical industry faced to the BREF process

Eddy van Bouwel,
Exxon Mobil Chemical Europe

The chemical industry in Europe

Before elaborating on the expectations of the Chemical Industry in relation to the BREF process, one needs to understand the scope and the significance of the Chemical Industry in Europe. The Chemical Industry produces some 500 basic chemical building blocks from raw materials such as petroleum products, natural gas and minerals. These building blocks form the basis of a very diverse industry that produces a myriad of a high value added products: polymers, fine chemicals, pharmaceuticals, agricultural chemicals, paints and varnishes, fibers, etc. , products that have enabled scores of new development and that help sustain 6 billion people on our planet. In economic terms, 30 % of the worldwide chemicals production is made in the EU, representing a turnover of 385 billion €. 36 thousand companies are grouped together in the Industry's European Trade Organization (CEFIC), representing employment for 1.7 million people in the Union. That is without taking account of indirect employment with service industries, engineering offices, equipment suppliers, etc. It is thus fair to say that a modern European economy without chemical industry simply would not be possible.

Figure 1 - The structure of the chemical industry



What is at stake ?

The Chemical Industry is fully committed to providing a high level of environmental protection. This is in fact an integral element of the Responsible Care program, implemented by the European Chemical Industry since the early nineties. The overall expectation of the Chemical Industry in relation to the BREF process can be expressed very simply: to contribute to achieving a high level of environmental protection while maintaining the viability of the European Chemical Industry in today's global market.

How can we translate this objective towards the BREF process ? First of all, it means that, in line with the definition of BAT in the Directive, the economic aspects of BAT need to be considered. Incremental investment for a specific technique needs to be in balance with the resulting environmental benefits. The VITO conference in February this year has demonstrated that there is no simple and generally accepted method to determine this balance. Let me just remind you here that when costs are taking into account, full installation and operating costs should be considered, not just the list price of equipment. There may also be significant cost differences for retrofitting technologies in an existing facility versus installing them in a new plant. Another challenge is that Chemical Industry BREFs must be applicable to small installations as well as to large integrated chemical complexes.

Finally we should remember that the BREFs are intended to be guidance documents. Ultimately local conditions must be taken into account to assess environmental benefits and determine appropriate emission limits. This then will allow the chemical producer to select the best technologies and techniques. BREFs should in other words be practical reference documents with added value that get the local regulator and the industrial applicant on the same page.

Practical considerations

Some practical elements to be considered in the BREF development process:

- the documents must remain descriptive documents - they should not become prescriptive;
- the scope of each BREF should be clearly defined; the Chemical Industry is a complex industry and there is a risk of overlapping between the different Chemical BREFs. This should obviously be avoided;
- it is particularly important to avoid overlap between sector BREFs and horizontal BREFs;the vertical BREFs should be strictly limited to sector or process specific information in those areas that are covered by a horizontal BREF to avoid providing confusing or conflicting information;
- while the Directive mandates consideration of the risk of accidents, care should be taken that the BREFs do not go into too much detail in this respect and start duplicating safety report information covered by the Seveso Directive;
- the selection of BAT for a specific industry should be based on practical application and demonstrated performance of a technique within that specific industry. It is indeed not always possible to simply transfer a technology from one industry to another;
- it should be recognized that in most cases performance will have to be described by a range, rather than a fixed number;

- multimedia effects need to be handled carefully. Sometimes emission or impact to one medium must be balanced versus an impact to another medium. Local conditions may determine the relative importance of each environmental impact;
- confidentiality of information must be dealt with appropriately. As competitors we are not free to share all details of our operations. This is particularly true for some source reduction techniques which may be embedded in confidential know-how.

The BREF process is not a simple exercise. But good quality BREFs are of key importance and we must be prepared to provide the necessary time and resources to accomplish this goal.

Summary

So what does the Chemical Industry expect of the BREF process: we expect constructive cooperation and dialogue between regulators, the scientific and engineering communities and the chemical industry that will result in practical BREF documents. Practical BREF documents will contribute to our dual ambition of good environmental performance and a sustainable Chemical Industry in Europe.

2.2 Lessons and expectations arising from the Non-Ferrous Metals BREF Note

Javier Targhetta,
Atlantic Copper

Introduction

In this short address I intend to reflect on the key lessons we have learnt during the drafting of the Non-Ferrous Metals BREF Note and share with you industry's expectations concerning its use by Regulators and Permit Writers in the Member States.

The Non-Ferrous Metals BREF Note

The Non-Ferrous Metals BREF Note is by far the largest written so far and yet it was completed in two years, i.e.in less time than any other Note. It has 761 Pages and an Executive Summary of 18 Pages. Annex 1 of the Directive, in Section 2.5, makes a distinction between Primary and Secondary Production of Non-Ferrous Metals, and the Commission originally intended that there would be two BREFs. Industry's recommendation, however, that the two should be combined into one Note in view of the cross linkages, was endorsed by the IPPC Bureau and the IEF and approved by DG Env.

It was decided, at an early stage, to group the 42 non-ferrous metals produced in the E.U. into ten groups:

Copper and its Alloys
Aluminium
Lead and Zinc
Precious Metals
Mercury
Refractory metals
Ferro Alloys
Alkali and alkaline metals
Nickel and cobalt
Carbon and Graphite

All common processes and equipment, however, were considered in an introductory chapter.

The Industry appointed a senior executive to manage the relationship with the IPPC Bureau and lead the industry delegation to the TWG. Ten Leading Experts, one for each metal/metals group, were appointed; each then formed a technical support group of specialists. The industry team spent around 3000 man-days on the project, at a cost exceeding 1million euros.

The responsible officers in the IPPC Bureau were Frank Farrell and Ludwig Finkeldei. We are delighted to see Ludwig here today.

There are four broad conclusions in the Note that merit mention;

- The strong influence of raw material composition on the choice of BAT.
- No single process is 'best'. Processes should be designed for the raw material.
- Collection and abatement systems are very important.
- Fugitive emissions can be the overwhelming source of emissions to air.

Lessons Learnt

We would offer the following advice to those industrial sectors that are yet to start drafting their BREF Note:

- Fully understand the IPPC Directive, the BREF Outline, the Preface and the standard introduction to the chapter dealing with conclusions on BAT and the concepts behind the texts.
- Understand and accept that you are primarily engaged in an 'exchange of information' with the Member States, the European Environmental Bureau and the Commission, as represented by the IPPC Bureau.
- Appreciate that the Directive is about 'site-specific' regulation and thus the BREF will not prescribe emission limit values.
- Appoint a senior technical manager to be responsible for managing the relationship between the industry and the officer in the IPPC Bureau responsible for drafting the Note, leading the industry's delegation to the TWG meetings in Sevilla and representing the sector on the Information Exchange Forum.
- Allocate the best technical brains and experience in the industry to providing process and environmental data and discussions with the Bureau, the Member States and the EEB.
- Do not hold back data; the Bureau is well able to handle confidentiality and competitiveness issues.
- Welcome site visits.
- When disputes occur, argue the industry's case professionally and dispassionately and try to reach agreement. In the limit you have the right to have your views recorded in the Note.

Expectations and fears of industry

BREF Notes are primarily addressed to the Member States. They have no legal obligation to do anything other than to 'note' the outcome of the information exchange process established under Article 16 of the Directive. Industry hopes, however, that all the States will make full use of the huge amount of high grade technical information in the Note and disseminate it widely down to local Inspectors of Pollution..

Our greatest fear is that local inspectors, perhaps unused to the responsibility of site specific permitting, may merely use in the permit the lowest figure in the ranges of emission values associated with BAT, without considering all the other factors discussed in the Note which determine BAT.

We hope that the Note will increase the understanding by Regulators and Inspectors of the metallurgical processes operated by the industry and the factors that influence pollution and its control. We also hope that they will do

nothing to reduce the industry's very high recycling rate, highlighted in the BREF.

This is but the first edition of a Note which has to be up-dated every three years. Along with the other BREFs that are about to be published, it is open to the criticism that cross-media issues and the selection of the best practicable environmental option are barely considered, due to the lack of the necessary robust methodology. Industry looks forward to working with the Bureau and the experts in the Member States on this difficult problem and providing processes and sites on which new analytical ideas can be tested.

Industry, as I explained earlier, has devoted huge resources to ensuring the success of this Note. It is reasonable for us to expect that, as well as the environment, industry also reaps some benefit from the BREF by way of more informed and effective environmental regulation. This means taking advantage of the site specific nature of the IPPC Directive and this Note to ensure maximum benefit to the environment (consistent with the requirements of the Directive) and minimum harm to the plant's international competiveness.

Thank you for your attention.

J. Targhetta

President

Atlantic Copper, S.A.

Madrid, Spain

23th March 2000

2.3 French Expectations concerning IPPC Directive and Reference Documents on Best Available Technologies (BREF)

Phillip Lucas,
Ministry of the Spatial Planning
and the Environment, France

France expects the IPPC Directive to be able to lead the protection of the environment to a high level as a whole, on the whole territory of the European Union, avoiding distortions from competition which can be involved by various regulations. For this purpose, France encourages actions in order to harmonise the practices among the Member States, especially procedures and technical prescriptions imposed to the operator of industrial and agricultural installations as well as the controls from the administration to check the following of those prescriptions. The distribution of information on the best available techniques is one of those actions.

The BAT concept is already implemented in the French system

The transposition in the French law of the Council Directive 96/61/EC on integrated pollution prevention and control is made through the law of 1976, July 19, relative to the classified installations for the protection of the environment. The French legislation is in accordance with the Directive since a long time as the regulation promoting an integrated approach is implemented since 1976 which was in reality an updating of a law dated 1917.

Today, all the provisions of the IPPC Directive are included in the French regulation and the last modification concerns the content of the impact study produced by the operator and which is required for the permit (monitoring of emissions and decommissioning included) and also the requirement for the operator to provide the inspection, every ten years, a balance of the running of the installation, in order to update the permit.

Thus, best available techniques' performances, economically viable, are a guide for setting permit emission values since more than twenty years. It is important to note that the BAT concept is used at two levels.

First, minimal requirements are fixed at the national level based on the performance of the best available techniques. These minimal rules are the result of a technical discussion with the trade unions and are submitted to the opinion of the Higher Council of the Classified Installations. (This entity is a consultative one under the competency of the Ministry of the Environment where non governmental organisations, specific trade unions, local inspectors, experts, people from ministers are gathered).

Secondly, for each installation, the permit procedure forsees that the impact study justifies the technological options, taking into account, in particular, the best available techniques. The impact study is one of the documents dedicated to local consultations, in particular during the public enquiry. The prescriptions contained in the permit can not be hardless than those fixed at the national level.

The publications from the European IPPC Bureau are for France a precious tool to set technical prescriptions for industrial and agricultural installations and so to contribute to drive the national regulation to a better protection of the

environment. The results of the first BREFs, in particular in the cement sector, have already been implemented and studies to reduce Nox emissions have been asked to the operators.

The protection of the environment should not be limited to the use of BAT

One must not forget the content of the preface which is common to the different BREF documents. From this text, the definition of the prescriptions to be respected by the operator to prevent pollution and risk should not only be based on best available techniques but should lay on two defence lines.

One of these lines is constituted by the performances of the best available techniques.

The other one is the analysis of the real impact of the mill on public health and on the local environment: quality of the biotope, other uses or balanced management of its resources, specifically for water. The implementation of the best available techniques should not exempt the operator from an accurate evaluation of the impact on the environment and consequences should be taken.

This is the reason why the prescriptions imposed to the operator must still concern, not the implemented processes, but the mill performances. It is of great importance to avoid the BREFs to block the state of the art of the techniques to the only ones mentioned in limited number as BAT in chapter 5 of the BREF documents. We also have to avoid the temptation of projecting one technological model as a compulsory one out of the boundaries, that would be opposite to the «raison d'être» of the IPPC Directive.

BAT performances should not be automatically used to set emission limit values

France intends to consider the techniques compatible with the BAT process as guidance to set emission limit values in the national regulation, in particular, when the techniques are able to minimise the different impacts and if no cross media effects are associated.

However, it is not always possible to precisely implement all the BAT to prevent and reduce emission in all media and use them as emission limit values, even for a new installation. Local environmental conditions as well as cross media effects have also to be taken into account. Usually a single technology that will be the best one for each criteria does not exist, but a package of technologies with various performance depending on the pollutants present does, and so the choice of a technology also depends on local conditions. On the contrary, it would not be acceptable that an installation, considering each one of its environmental impacts, presents environmental performance below the guidance described in the BREF documents.

BREFs must consider the technological performance all over the life of the mill

Prescriptions should be linked to real performance during the all life of the installation and not reduced to certain operating theoretical or favourable conditions. France will take care that BREFs consider, in the description of the techniques, the particularities linked for example to the starting, the necessary stops and the incidents of the process and for which the recognised performance should be less than in normal situation.

BREF must be a tool for existing plants to drive environmental performance

For existing plants, France will use BREFs as guidance to drive them to a better protection of the environment. It is not foreseen to impose a systematic obligation to use BAT, but the objective is to have the guarantee that installations move in an appropriate way that takes into account the progress of techniques, in particular techniques to prevent or reduce emissions to the environment.

The French legislation gives the opportunity to modify when it is wished by the inspector, following a procedure that guarantee the rights of everybody, the prescriptions imposed in the permit in order to take into account the evolution of the techniques to protect man and the environment. However, the operator is obliged to make each ten years a balance concerning its installation which is the occasion to compare the performances of the implemented preventive and end of pipe techniques measures dedicated to the protection of the environment with BAT ones. The inspector uses this balance to update the permit as it is mentioned in article 13 of the IPPC Directive.

Developing actions must be financed for BREF actualisation

In order to keep a high level of quality to the BREF documents, they should be updated on a regular basis, so that emerging techniques become mature, could be included and also to assess other technologies.

It would be interesting this action to be completed by financial tools to improve the performance of the processes dedicated to the prevention and control of emission, to develop new processes and to reduce the operating costs.

The distribution of information on BAT must be as large as possible

Each BREF should be a tool to drive the economy of the concerned activity. The distribution of BREFs must be as large as possible, in particular to the concerned trade unions.

I would like to stress the attention of the European Commission on the fact that, in order to assure a large implementation inside all the European countries, the documents should be integrally translated into the nine languages of the European Union.

BREF must assure mutual improvements for the whole industrial sector

From compared performances of various economical sectors, the different BREF documents should allow to identify and analyse the heterogeneous facts among sectors, specially regarding the acceptable characteristics of a technology from an economical sense. We can hope that the working group on economical aspects will answer this question and will lead, in relation with the concerned sectors, to practical proposals for performances improvements.

Others transversal themes must be approached. For instance the methodologies used to control the technical prescriptions must be harmonised, specifically for metrology. So, the results of the working group on monitoring systems will have a major impact on the system.

Exchanges on BREF must go on

Exchanges among the Member States are fruitful. For France the «Sevilla process» must go on with a high quality level. In order to achieve this high level, France would like the consultation to be improved. So, for many BREFs, an intermediate plenary meeting would be desirable between the kick-off meeting and the closing meeting of the working group.

The production of 6 BREF per year seems to be a reasonable rhythm. No more than 200 pages for each document should be convenient, and a BREF document covering a too large field is subject to quality degradation. The common areas among BREF should be minimised, in particular among sectorial documents and horizontal documents.

Article 16 from the IPPC Directive systematises and amplifies the exchange of information about available technologies. For several years, the IMPEL network has been working for promoting the exchange of best practices in the implementation and control of Community environmental legislation and particularly for industrial pollution. Recently the European Parliament and the Council elaborated a recommendation for minimum criteria for environmental inspections of industrial installations in Member States. IMPEL working groups also studied comparison of technical standards and technologies to prevent and control the emissions for various kinds of installations.

As indicated by the subsidiarity principle, each Member State has to assure the implementation of BAT, so that the IMPEL network could give the appropriate framework for such exchanges.

The integrated approach should be extended for a better environment protection

In France, the integrated approach goes far beyond the demands of IPPC Directive. The same authority delivers emissions permit and defines the prescriptions for risk or noise. So, in each permit demand for a mill, the operator has to present an environmental impact document and a safety study.

France thinks it is necessary, in the definition of the best available technologies, that we examine the permanent polluting flows and also the major accident hazards. This approach has been proved efficient in France for the protection of the environment.

So France proposes that the IPPC Directive could move towards prevention of risks, specially with the delivering of a unique permit for prevention of pollution and risks. The best available technologies should then become a development vector not only for pollution prevention but also for accident prevention.

2.4 Spanish experience with the BAT info exchange

Maria Jesus Rodriguez de Sancho,
Ministry of Environment, Spain

EXPECTATIONS OF IPPC AND BAT

SPANISH EXPERIENCE WITH THE BAT INFO EXCHANGE

Ministry of Environment
Spain

María J. R de Sancho
Head of Division for Industry and Environment

Difficulties in the IPPC implementation process in SPAIN

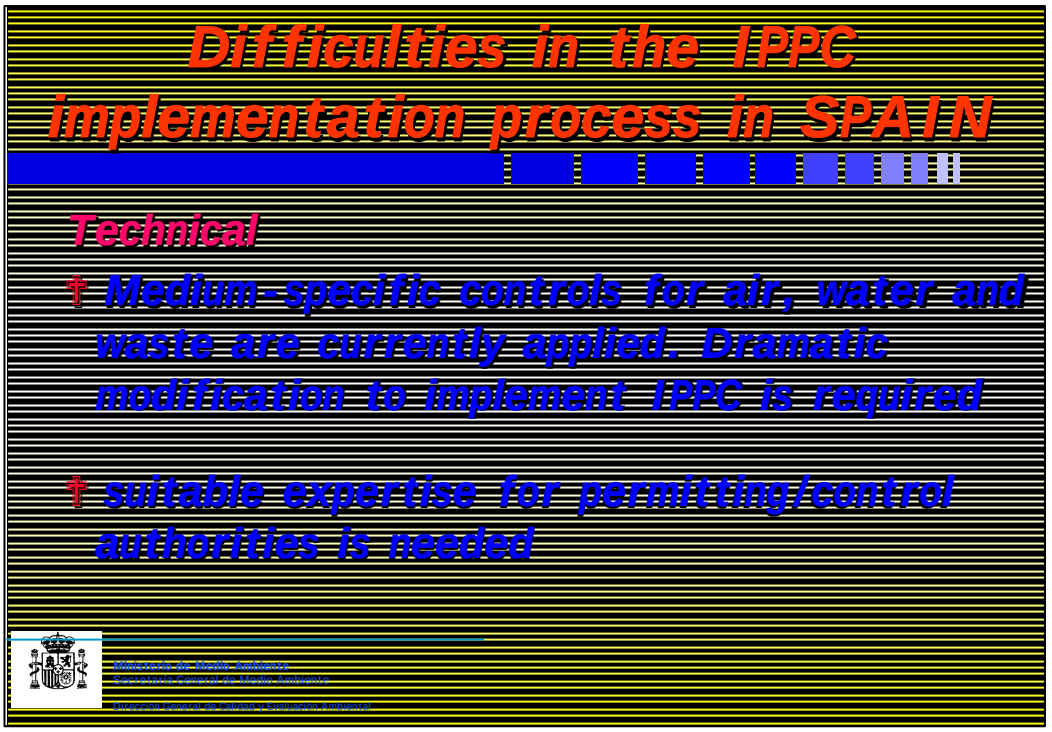
Constitutional

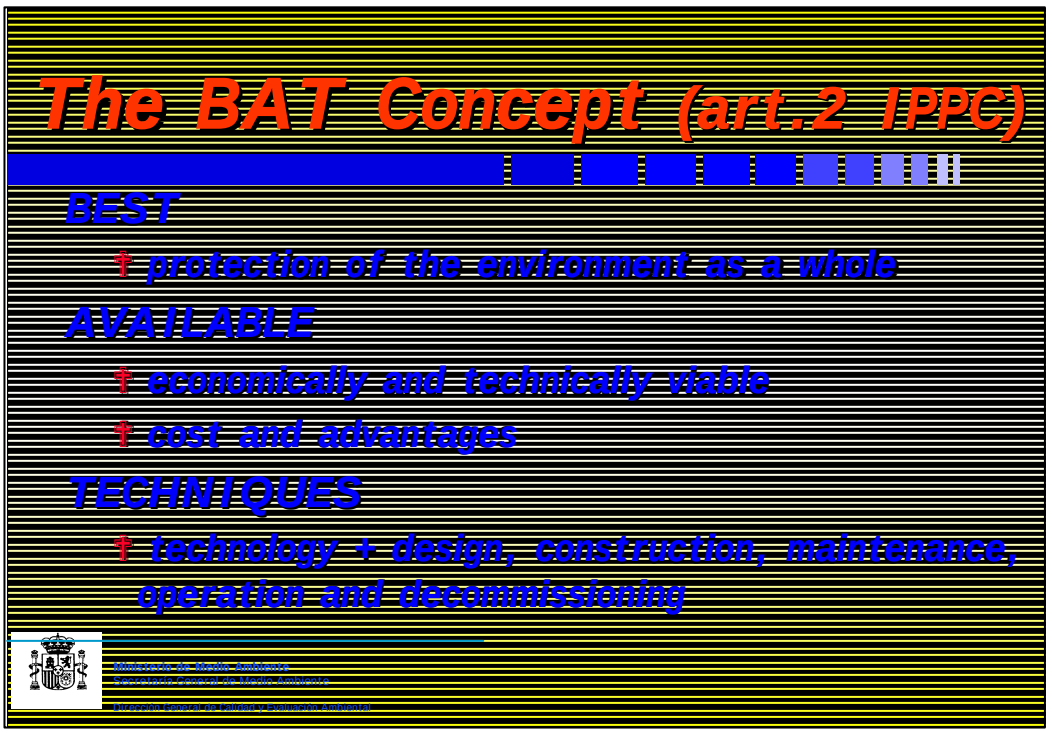
- decentralised system of government: IPPC site-specific approach> different conditions from one site to the next

Administrative

- a system of 'co-ordinated pollution control' in which separate organisations are involved has to be implemented (fear of loss of power)

Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental


Difficulties in the IPPC implementation process in SPAIN
Technical
† Medium-specific controls for air, water and waste are currently applied. Dramatic modification to implement IPPC is required
† suitable expertise for permitting/control authorities is needed
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental


The BAT Concept (art.2 IPPC)
BEST
† protection of the environment as a whole
AVAILABLE
† economically and technically viable
† cost and advantages
TECHNIQUES
† technology + design, construction, maintenance, operation and decommissioning
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

BAT Info Exchange

- Required by Directive (art. 16.2)
- purpose to support competent authorities
- published BAT Reference Documents (BREFs) for each sector
- players: DG XI, IPPCB, IEF, TWGs
- must be taken into account by competent authorities

Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

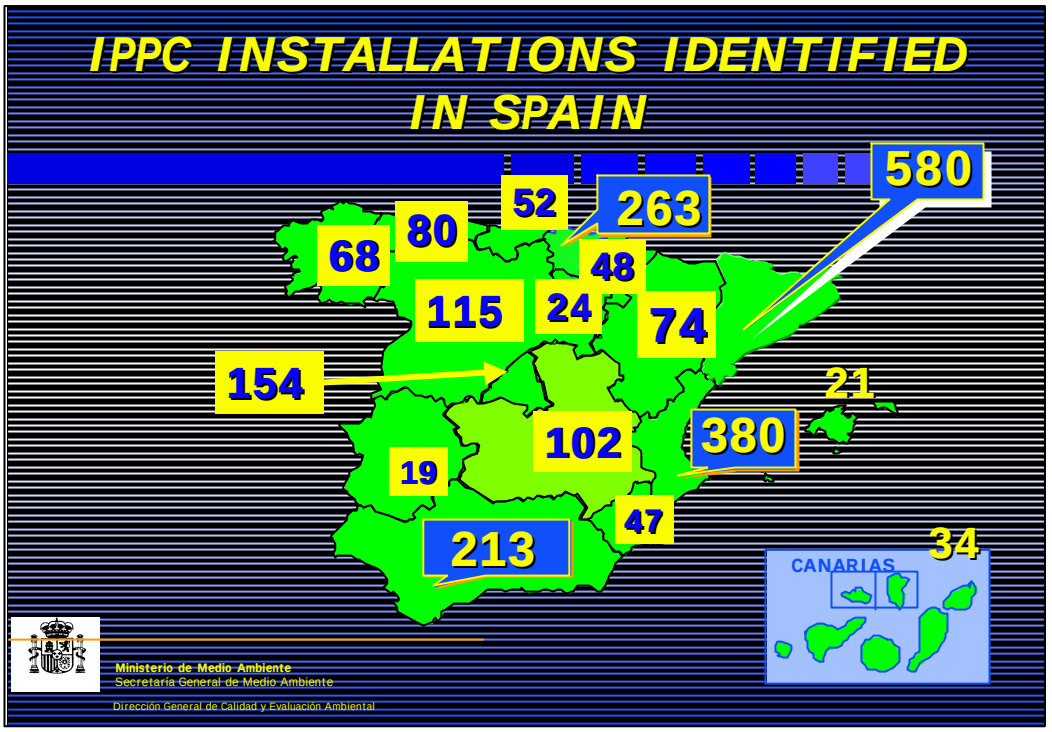
TECHNOLOGICAL IMPLICATIONS OF IPPC DIRECTIVE IN SPAIN

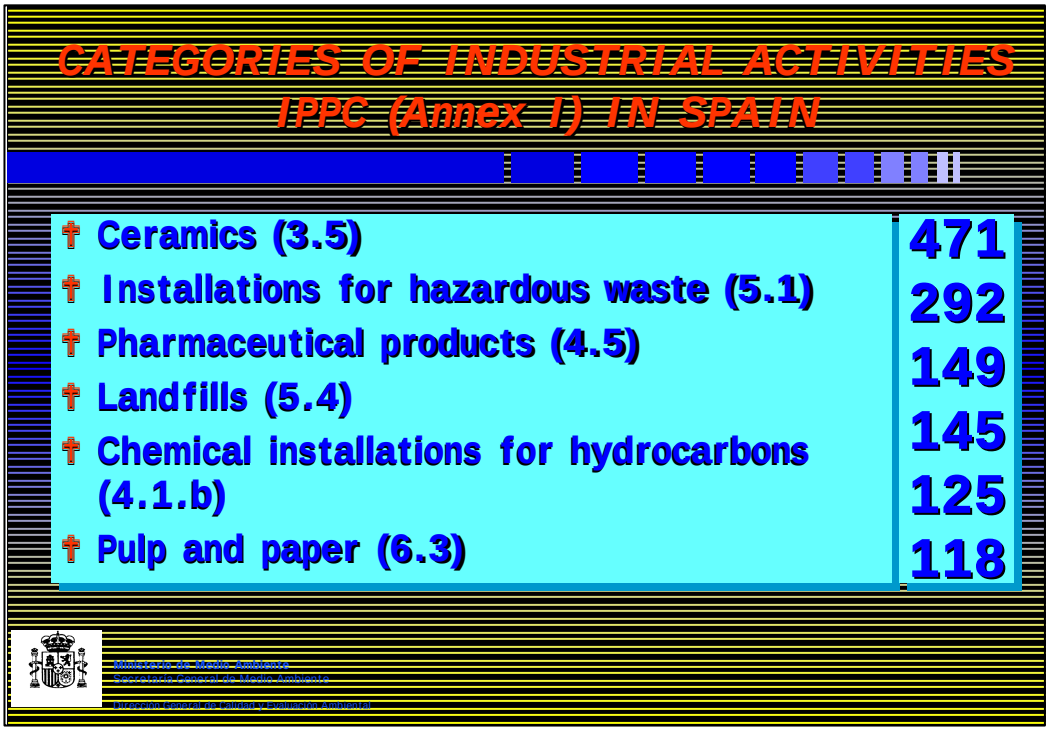
- Number of installations covered by IPPC:

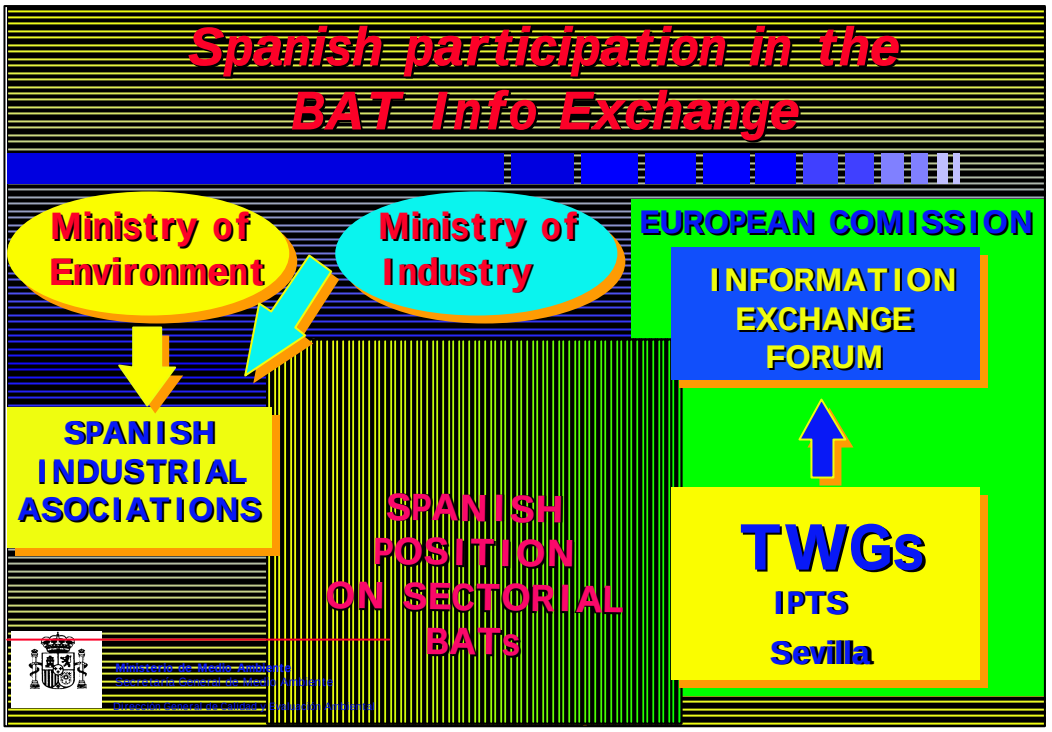
about 2.800

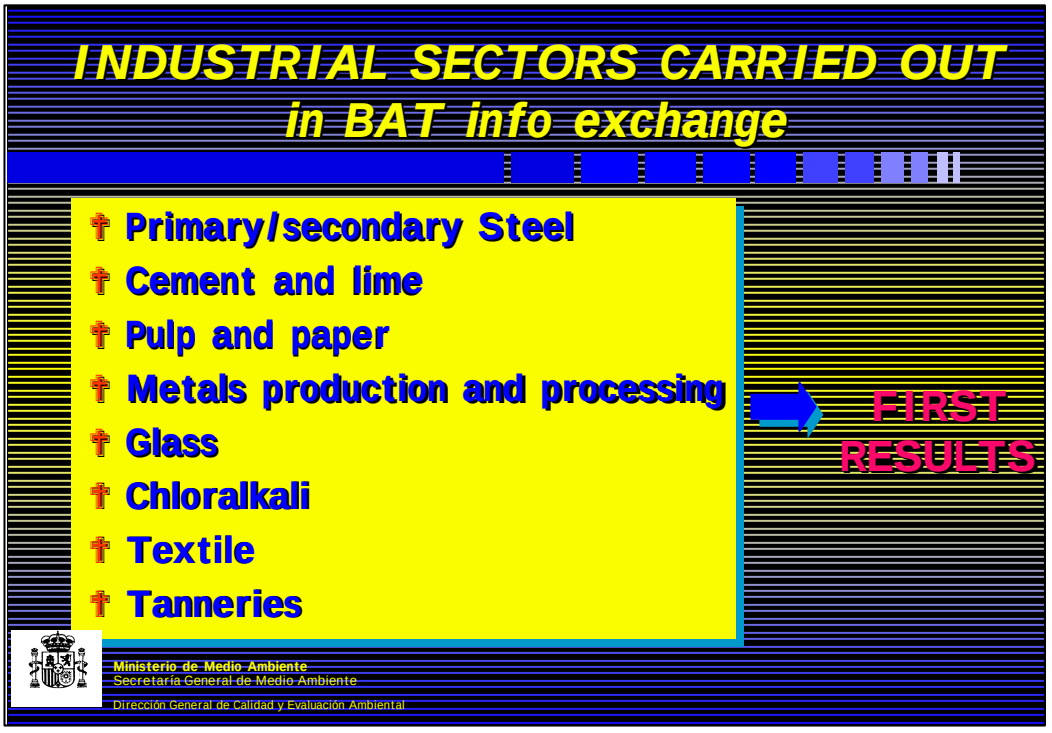
- Uneven geographical distribution
- Identification of main industrial activities affected

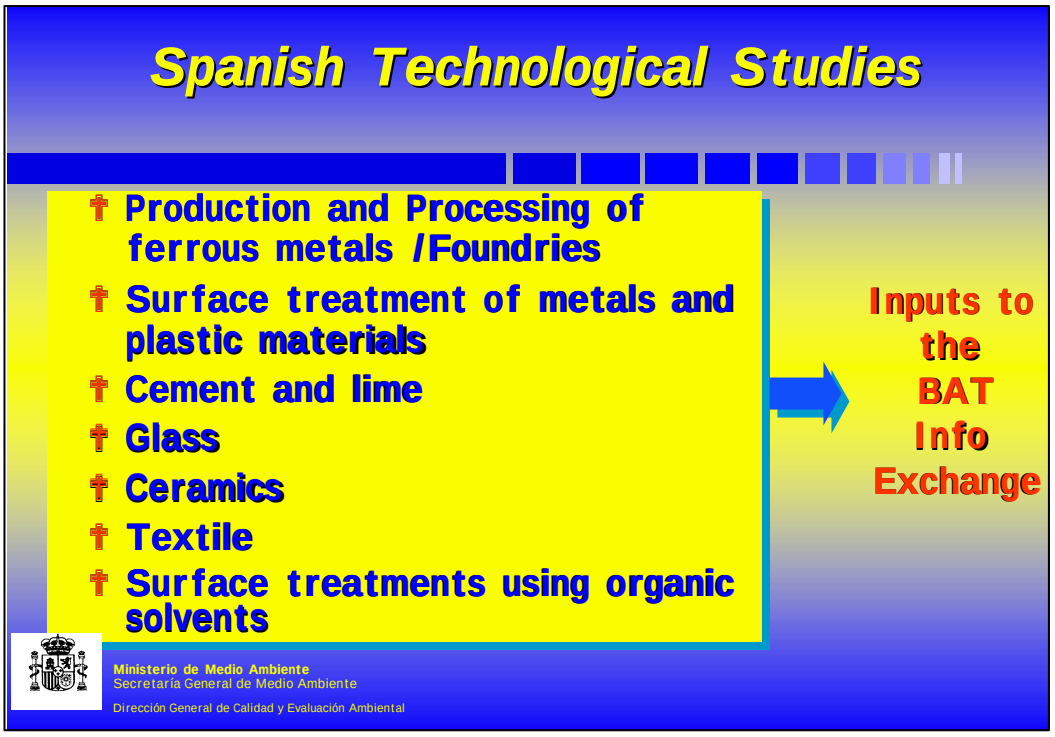
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

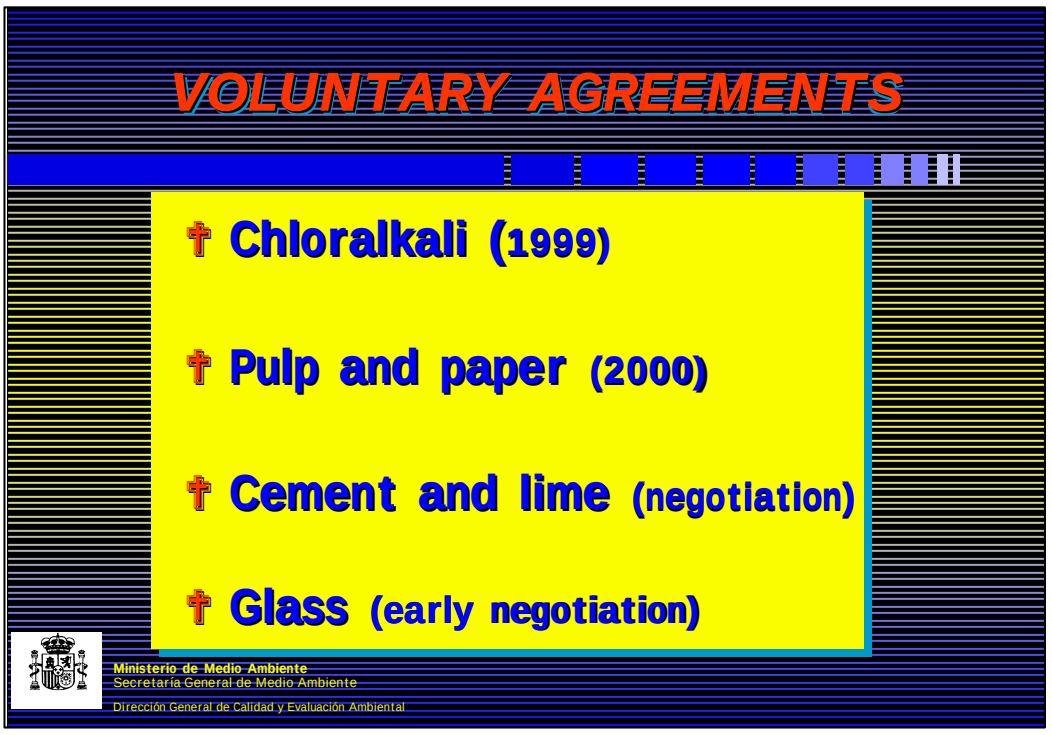

IPPC INSTALLATIONS IDENTIFIED IN SPAIN
580
52
263
80
68
48
115
24
74
154
21
102
380
19
47
213
34
CANARIAS
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental


CATEGORIES OF INDUSTRIAL ACTIVITIES IPPC (Annex I) IN SPAIN
Ceramics (3.5) 471
Installations for hazardous waste (5.1) 292
Pharmaceutical products (4.5) 149
Landfills (5.4) 145
Chemical installations for hydrocarbons (4.1.b) 125
Pulp and paper (6.3) 118


Spanish participation in the BAT Info Exchange
Ministry of Environment
Ministry of Industry
EUROPEAN COMISSION
INFORMATION EXCHANGE FORUM
SPANISH INDUSTRIAL ASOCIATIONS
SPANISH POSITION ON SECTORIAL BATs
TWGs
IPTS
Sevilla
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental


INDUSTRIAL SECTORS CARRIED OUT in BAT info exchange
Primary/secondary Steel
Cement and lime
Pulp and paper
Metals production and processing
Glass
Chloralkali
Textile
Tanneries
FIRST RESULTS
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental


Spanish Technological Studies
Production and Processing of ferrous metals /Foundries
Surface treatment of metals and plastic materials
Cement and lime
Glass
Ceramics
Textile
Surface treatments using organic solvents
Inputs to the BAT Info Exchange
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental


VOLUNTARY AGREEMENTS
Chloralkali (1999)
Pulp and paper (2000)
Cement and lime (negotiation)
Glass (early negotiation)
Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

PRELIMINAR CONCLUSIONS

- Active participation of industry: raising environmental awareness/opening to public
- industry know new environment legislation in advance
- Spanish industry representatives, working together with representatives from the European industry
- big effort is being made to know current and achievable environmental performance in industrial sectors

Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

PRELIMINAR CONCLUSIONS
weak points (1)

- Insufficient consideration to the economic aspects when determining BAT (size, price of energy, raw materials)
- Difficulties to define a methodology for cross media aspects assessment at sector and at local level

Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

PRELIMINAR CONCLUSIONS
weak points (2)

- concern that the associated emission levels in BREFs will be considered as prescriptive ELVs resulting in a hide transfer of environmental technology
- partial translation of BREFs will not reflect the actual info exchange

National Guidance notes are needed

Ministerio de Medio Ambiente
Secretaría General de Medio Ambiente
Dirección General de Calidad y Evaluación Ambiental

2.5 The IPPC Directive and the BREF Notes, as seen by the installation suppliers

Prof. Jean-Francois Vicard,
STRATENE - Consulting, Lyon
(Former expert for EUROVENT)

For the installation suppliers, the IPPC Directive is expected to harmonise, within the European Union, the concept of Best Available Technique (BAT) to be used for establishing the Emission Limit Values (ELV) for a given industrial application. For this the BAT Reference documents (BREF Notes) elaborated in the Sevilla process should be an efficient tool.

Since all aspects cannot be discussed now, I shall focus my presentation on the three following questions (slide 1):

?? How to select the relevant techniques ?

?? How emission measurements can be made comparable ?

?? How to select the relevant basis for cost calculations ?

How to select the relevant techniques

Article 2.11 gives the definition of the Best Available Techniques (slide 2). This definition is well known and we can read again the most significant parts to try to answer the above question :

> *"BAT shall mean 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 ……..generally to reduce emissions and the impact on the environment as a whole……..Available techniques shall mean 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……."*.

From this it is clear that the BAT cannot be identified on the basis of laboratory pilot as well as on the characteristics of "old" installations. It is necessary to identify "advanced" installation of appropriate scale for implementation in the considered industrial sector. Further indications are given in Annex IV (slide 3):

?? Point 4 refers to "comparable processes which have been tried with success on an industrial scale"

?? Point 5 refers to "technological advances...."

?? Point 7 refers to the commissioning date for new and existing installations"

?? Point 8 refers to "length of time needed to introduce the BAT"

Consequently a small "industrial" installation (for instance on a side stream) will provide relevant characteristics of the considered technique.

In this context, the installation suppliers may bring a valuable contribution to the success of the Sevilla process.

How emission measurement can be made comparable

Fair competition as well as efficient determination of the characteristics of the BAT require that the emission measurements taken at one industrial site can be reasonably compared to an ELV, to the results obtained at another site. This is also necessary to reasonably evaluate the impact on the environment or to apply model using emission data (slide 4).

It is expected that accreditation against European CEN measurement standards will secure such comparability, provided that the "gray zone", the uncertainty attached to any measurement result is documented in the CEN Standards specifying measurement methods for all domains considered in the IPPC Directive.

As CEN representative in the TWG Monitoring in the Sevilla process, I can say that already a lot of work has been done in CEN, especially in the air field under mandate of the DG Environment. Further works are still to be carried out and require, in my opinion, more involvment of the user of measurement results.

Finally it is expected that the Sevilla process i.e. the exchange of information under article 16.2 will contribute to improve the comparability of emission measurement especially through the work of the TWG Monitoring.

How to select the relevant basis for cost calculations

In its title the IPPC Directive calls for "integrated" actions. This raise the question of the whole domain to be considered to evaluate the costs. In article 2.11 reference is made to the reduction of "emissions and of the impact on the environment as a whole". More detailed points to be considered are given in Annex IV (slide 5):

- Point 1 refers to "the use of low-waste technology"
- Point 2 refers to "recycling of substances generated....where ppropriate"
- Point 9 refers to "the consumption and nature of raw materials used in the process"

For many applications, this results in a complex technical field and in a large basis on which costs calculations shall be made. This will be illustrated with the two following examples:

In combustion plants, low-NO_x burner are often considered as an efficient primary measure, by changing the combustion conditions. If such modifications are too important, then there is a significant increase of CO emission as well as the generation of fine carbonaceous particle requiring additional dedusting facilities and additional waste handling, all resulting in additional costs.

In combustion plants, reduction of SO_2 emissions is also to be considered:

- Very often a medium-low sulphur fuel is used and an appropriate deSO_x facility is installed

- Another possibility is to use a very low sulphur fuel with a higher price, but with a lower investment cost
- Another possibility is to use a high sulphur fuel at a much lower price and to invest more on the deSO_x facility

Consequently the basis of the cost calculation shall also consider the price differences between fuels, in relation with their sulphur content. Presently, for coal, there is only minor price differences. For oil, it is technically feasible to extract in refineries the largest part of the sulphur, but this require important investments, so that a better solution is to use heavy oil with high sulphur content in combustion plants fitted with appropriate deSO_x facility, producing gypsum used as raw material in the cement and plaster industries. It is to be noted that this overall optimum is not the combination of optimum conditions for each subsystem, such as the gas cleaning itself.

It is expected that the Sevilla process will help to take into account the appropriate basis for technical and economical evaluations.

Conclusion

In this presentation were selected and approached three items relevant for the IPPC Directive and the BREF Documents as seen by the installation suppliers. This can be summarized as follows (slide 6):

- In view of selecting and documenting the relevant techniques, the installation suppliers may bring a valuable contribution to the success of the Sevilla process.
- It is expected that the Sevilla process i.e. the exchange of information under article 16.2 will contribute to improve the comparability of emission measurements, especially through the work of the TWG Monitoring.
- It is expected that the Sevilla process will help to take into account the appropriate basis for technical and economical evaluations.

Annex

The IPPC Directive and the BREF Notes, as seen by the installation suppliers

JF VICARD

STRATENE , Lyon

1 - How to select the relevant techniques ?

2 - How emission measurement can be made comparable ?

3 - How to select the relevant basis for cost calculations ?

4 - Conclusions

IVU Stuttgart 6-7 April 2000 1

IPPC Directive Article 2.11

"Best available techniques" shall mean 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……generally to reduce emissions and the impact on the environment as a whole ……..."available" techniques shall mean 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……"best" shall mean most effective in achieving a high general level of protection of the environment as a whole.

IVU Stuttgart 6-7 April 2000 2

Annex IV

Considerations to be taken into account ….when determining BAT, bearing in mind the likely costs and benefits of a measure and the principles of precaution and prevention:

……..

4 - "comparable processes….which have been tried with success on an industrial scale"

5 - "technological advances ……."

7 - "commissioning dates for new or existing installations"

8 - "length of time needed to introduce the BAT"

IVU Stuttgart 6-7 April 2000 3

2 How Emission Measurement can be made comparable ?

- **Results at site A comparable with those of site B**
- **Results at site X comparable with ELV**
- **Accreditation and CEN measurement standards**
- **TWG Monitoring in the Sevilla process**

IVU Stuttgart 6-7 April 2000 4

Annex IV

Considerations to be taken into account ….when determining BAT, bearing in mind the likely costs and benefits of a measure and the principles of precaution and prevention:

1 - "use of low-waste technology"

3 - "…….recycling of substances generated……..where appropriate"

9 - "consumption and nature of raw materials used in the process……."

IVU Stuttgart 6-7 April 2000 5

Conclusions

IPPC and BREF as seen by the installation suppliers:

- **In view of selecting and documenting the relevant techniques, the installation suppliers may bring a valuable contribution to the success of the Sevilla process.**
- **It is expected that the Sevilla process i.e. the exchange of information under article 16.2 will contribute to improve the comparability of emission measurement especially through the work of the TWG Monitoring.**
- **It is expected that the Sevilla process will help to take into account the appropriate basis for technical and economical evaluations.**

IVU Stuttgart 6-7 April 2000 6

2.6 The IPPC Directive and BAT in a wider context

Nigel Haigh,
Institute for European Environment Policy, London

The Directive as an aspect of the broad IPPC concept

An OECD Monograph (OECD 1991) gave a name to a broad concept, which it illuminated by describing it as a *shift in focus for decision making:*

Away From	Towards
Water	Substance
Air	Source
Land	Region

Since polluting substances move through all the environmental media (water, air and land) controls over one medium alone is likely to be ineffective. A source of polluting substances, such as an industrial plant, may emit them to all three media and controls over one medium may just shift them to another medium. A substance may need to be controlled at many points as it moves through its commercial or environmental life cycle. Vulnerable regions such as a river estuary or confined sea, will accumulate polluting substances that arrive via all media, and effective protection will require controls over all sources initiating diffuse sources.

The IPPC Directive derived its name from OECD but is only concerned with one of these three aspects of the broad concept. The title of the Directive is therefore slightly misleading. The broad concept is of course much older and was well described by President Nixon when he announced the creation of the US Environmental Protection Agency (CEQ 1970). Why the EPA failed to adopt an integrated approach is a story for another day.

Best for What? - Origins of the IPPC Directive

The need for an EC Directive on "integrated permitting" of industrial plants was one conclusion of a project undertaken between 1986 and 1988 by IEEP and the Conservation Foundation (Washington) that we called "Integrated Pollution Control in Europe and North America". We spoke publicly about the need for such a Directive at the concluding conference in Brussels in November 1988 and referred to it in the resulting book (Haigh and Irwin 1990). We then developed the argument in a report written for DG Environment (IEEP 1989). This reviewed the possibilities for a Community Strategy for integrated (multi-media) pollution control in the light of developments in several Member States and recommended "an integrated permitting Directive as the most fruitful first step". The objective would be to minimise total emissions from an industrial installation and the total impact on the environment i.e. it would be a driver for clean production rather than just for end of pipe technology. It implied a big change from the type of BAT (NEEC) defined in Directive 84/360 which required "best" technology only for preventing air pollution. However the stimulating discussions on the new meaning of BAT (best for what?) only really started once drafting of the Directive began.

Logically the IPPC Directive should have preceded the EMAS Regulation but Commissioner Ripa di Meana believed that environmental auditing was a more exciting driver for integrated environmental protection. Since EMAS inspired ISO 14001 which has been widely adopted throughout the world he may have had a point. There was some resistance to the idea of the IPPC Directive within DGXI particularly from those responsible for water. Interestingly the pressure for the Directive came mostly from those concerned with chemicals policy who had thought most about integrated approaches.

Drafting of the IPPC Directive only started in 1991 when a British expert was sent to DGXI. Although he used the newly adopted UK legislation as a starting point the many differences between the adopted Directive and the UK legislation show that other Member States contributed. There were tensions over the meaning of BAT. One German commentator noted that the "... draft Directive has added a new element to the longstanding divergence between the British and the German approaches to pollution control – a modified version of BAT(NEEC) and environmental quality standards vs. fairly stringent emissions limit values at Community level", (Schnutenhaus 1994).

A new element that has to be recognised is that 'best' for reducing impact on the environment as a whole must take some account of local environmental conditions. 'Best' can therefore vary from place to place. For example where water is in short supply, a water intensive process may not be 'best', whereas it may be where water is plentiful.

The Directive does not require BREFs - only exchange of information on BAT

The Directive nowhere mentions "BAT reference documents" (BREFs), but the Sevilla process is a reasonable administrative response to the Articles of the Directive relating to BAT which:

- define BAT – Art, 2 (ii)
- require emission limit values to be based on BAT (for reducing impact on the environment as a whole), but also to take into account geographical location and local environmental conditions – Art 9(4)
- require competent authorities to be informed of developments in BAT – Art II
- require Member States to send the Commission information on emission limit values and, if appropriate, on BAT – Art 16(1)
- require the Commission to organise an exchange of information on BAT and to publish the results – Art 16(2)

Will BREFs lead to emission limits in daughter Directives?

The Directive foresees the Community adopting daughter Directives setting emissions limit values (Art. 18) particularly if, as a result of the exchange of

information, "the need for Community action has been identified". Will this happen? Nobody can yet know.

Some people, during the negotiations, believed that the exchange of information was intended to lead to daughter Directives (Schnutenhaus 1994). Others see BREFs as a way of avoiding the need for daughter Directives. The same divergence of opinions had arisen over the 'Technical Notes on BATNEEC' that were drafted following Directive 84/360.

If in the future BREFs are found to be perfect and all Member States follow them perfectly, then there should be no need for daughter Directives. This conference may begin to tell us whether it is possible to prepare good BREFs that are relevant in all Member States despite the varied geographical situation in Europe. But even if BREFs are perfect it will be many years before we know whether Member States follow them perfectly. There will be fascinating discussions about whether perfection means 'clean production' or 'no distortion to competition' or both, and what level of imperfection will be tolerated by the public, by environmental NGOs and by industry concerned with distortions to competition. There were always risks in the new approach to BAT since it is more difficult to define then single medium BAT, but I remain convinced that BAT, where 'best' means best for the environment as a whole, in a much better driver for environmental improvement then the BAT or BAT (NEEC) it has replaced.

References

CEQ, Council on Environmental Quality (1970): *Environmental Quality: The First Annual Report of the Council on Environmental Quality.* US Government Printing Office, Washington DC

Haigh, Nigel and Frances Irwin (1990) *Integrated Pollution Control in Europe and North America* The Conservation Foundation, Washington DC and IEEP London

IEEP, Institute for *European* Environmental Policy (1989) Possibilities *for the Development of a Community Strategy on Integrated (Multi-Media) Pollution Control.* IEEP, London

OECD, Organisation for Economic Cooperatives and Development (1991) *Integrated Pollution* Prevention *and Control*. Environment Monograph No 37

Schnutenhaus, Jörn, (1994) Integrated Pollution Control: New German Initiatives in the European Environment Council European Environmental Law Review December 1994

2.7 Is the BREF process a success or a failure? – an NGO perspective

Dr. Joachim Lohse & Knut Sander,
Ökopol – Institut für Ökologie und Politik GmbH, Hamburg

How environmental NGO participation in the BAT process is organised

The European Environmental Bureau (EEB) is the Federation of Environment Associations to the European Community, representing 137 associations of 26 countries. The organisation is participating in the process of drafting BAT Reference Documents at two different levels: firstly, the meetings of the Information Exchange Forum (IEF) are regularly attended by a representative from the EEB office in Brussels, and secondly the EEB nominates technical experts from independent institutions in order to represent the environmental non-governmental organisations in the Technical Working Groups (TWG) which are dealing with individual sectors of industry.

The authors of this presentation have been (or are still) representing the EEB in the TWG's on Cement & Lime, Iron & Steel, Non-ferrous Metals Industry, Ferrous metals Processing, and Refineries. In a similar way, our colleagues from other institutes have participated in the TWG's on Large Combustion Plants, Cooling Systems, Smitheries and Foundries, Pulp & Paper, and Chemical Industry.

This labour-intensive work requires a strong engagement and a high level of commitment to European environmental policies and is done on a more or less fully honorary basis. Consequently, it is not always easy for the EEB to recruit competent experts when new TWG's on other industrial sectors are started.

Expectations at the beginning of the process

Having gathered ample experience with industrial permitting procedures at the national level over quite some years, we expected the European BAT discussion to improve the overall diffusion of information and transparency concerning not only the best performing techniques presently in use in the individual Member States, but also an improved information transfer about new developments in specific sectors or regions.

We found our expectations pretty well reflected in the opening statements of a Commission Representative from DG Environment at one of the TWG meetings in Seville:

- IPPC is about public access to information and transparency;
- BAT is a tool to drive environmental performance;
- BAT is not only about techniques currently in use;
- the term "emerging techniques" does not refer to techniques "that are waiting just around the corner" but is rather like "star-gazing";
- There is no reason to exclude outliers *a priori*.

As we volunteered for the Technical Working groups, we expected an open-minded information exchange that would mainly focus on ambitious performance levels of modern industrial processes and abatement techniques.

On the other hand, there was a great deal of uncertainty whether environmental NGO experts would be given a fair chance of participation, or whether they would rather be misused as "fig-leaves" in a process which is dominated by industry. Because of the known unbalanced resource distribution between industry and environmental NGOs, we expected from the IPTS bureau to listen to our arguments even more carefully in order to avoid distortions of the BREF documents.

Experiences in the technical working groups

Speaking frankly, the actual discussions which took place particularly in the early TWGs (i.e. on Cement & Lime and Iron & Steel) looked quite different from what we had expected. Already in the phase of specifying the key environmental impacts of the sectors in question, it was a rather difficult task to make sure that all relevant impacts (including e.g. emissions of volatile heavy metals or persistent organics due to processing of wastes) are adequately being dealt with in the BREFs.

But even when there was no such dispute, we found that already the mere data collection about industry's actual performance levels would have been rather selective if there had been no environmental NGO representation. The draft BREF's were mostly relying on industry submissions in which neither the best-performing installations, nor the plants with abnormally high emissions were reported. In other cases, certain emissions were dealt with by judging statements such as "insignificant", rather than reporting actual emission levels for which data are easily accessible.

However, raising these issues would by no means mean that the gaps in the draft BREF's would automatically be filled in adequately. More than one time, we found ourselves in the position of technical consultants who had to investigate all relevant facts ourselves. But even if we presented hard information, sometimes we had to go through a political dispute before we could see our information reflected in the BREF's.

Having established a fairly satisfying database, similar discussions arose each time when a certain technique, associated with its related performance level, was to be presented as a candidate BAT technique in the Chapter on "Techniques to be considered in the determination of BAT", and even more so when it came to the shortlist on Best Available Techniques for a sector. E.g. it is hard to understand why the proven existence of 10 reference plants, plus existing legal emission limit values in one or several Member States, are often still considered as insufficient documentation of an "emission level associated with BAT" by some TWG members but also the IPTS office.

With such an approach, the BREF documents appear to have a certain tendency of suppressing information, rather than creating transparency. This happens not only with the best performers of the industrial sector in question,

but also with certain advanced techniques which are well-established in some industrial sectors but not in others.

Additional difficulties arise when, apparently after intense informal consultations between industry representatives and the IPTS office in Seville, new drafts of the BREF are circulated which have undergone fundamental changes in relation to what has been consensus at a preceding TWG meeting. Significant changes in the structure of documents often make it impossible to follow whether our inputs have been included in the new version, or whether contributions that were included in previous drafts have been silently skipped in the meantime. Several times it was embarrassing to see that key statements were fundamentally altered, but without giving specific notice to draw the reader's attention to these changes.

Thus it requires an extraordinary effort of time and engagement particularly in the late stages of finalising the BREF to prevent that everything is lost again which the environmental NGO representatives could achieve during the whole process. In some sectors, the final BREFs are so voluminous, and the deadlines for reaction so short, that it would be an illusion to believe that NGO participation has had any substantial influence on the content of the final documents.

Analysis: strengths and weaknesses of the process

The IPPC Directive mainly describes a procedure how to achieve the general target of an ambitious level of environmental protection in the European Union, but without specifying harmonised benchmarks in terms of e.g. emission limit values for certain industrial sectors. As it is still largely unclear how the BREFs will be implemented in the Member States, the TWG discussions suffer from being overloaded with political interests, rather than concentrating on their original purpose of collecting and evaluating factual information on technical issues.

Time and again, those interest groups who would have to undertake significant efforts in order to be in line with the "Best Available Techniques" [i.e. "the most effective and advanced stage in the development of activities and their methods of operation..." (Art. 2 (11) of Dir. 96/61/EC)], by means of political pressure have managed to introduce several procedural "filters" in the BREFs with the purpose of ruling out information about advanced technologies with their associated performance levels. This happened at the various stages of data collection, identification of BAT candidates, and the final determination of BAT.

Typically, these procedural filters include questions of applicability in each and every type of installation (which would be the precise opposite of "best available techniques"), in combination with unproven claims that costs would be exorbitant. Best performing installations are considered as local peculiarities which are not worth mentioning in a general document, while one single old installation which would not be able to implement a certain improvement

measure is taken as sufficient proof that this measure cannot be considered as BAT in a general sense.

In our understanding, this is a fundamental misinterpretation of the technical information exchange process whose purpose should be to put all the information on the table before beginning to select.

Often the discussions suffer from the fact that there appears to be either insufficient knowledge or lacking willingness to create a sound data basis of advanced performance levels of industry, which would include precise reporting of e.g. observed emission levels in combination with the associated reference periods in terms of daily or long-term averages.

Missing rules for adequate reporting about performance levels, in combination with the lack of objective criteria for BAT selection, inevitably result in conflicting interests between industrial late-comers and environmental NGO representatives. In the absence of clear rules for decision making and conflict management, the BREFs' central sections on BAT are often the result of a "bazar"-like negotiating process rather than being fertilized by the wisdom of technical expertise.

As a fundamental flaw of the procedure, it must be stated that often the industry representation in the TWGs does not reflect the full spectrum of economic actors. More precisely, the potential "winners" of environmental progress, i.e. the fore-runners of the sector in question, competitors from related sectors, and also the suppliers of modern machinery and equipment are systematically underrepresented in the TWG discussions.

As a result, there are cases in which one single environmental NGO representative bears the main load of defending the public interest to achieve a general improvement of the status of the environment, at the same time indirectly representing all the suppliers' and competitors' interests, and promoting the economic potential lying in the development, marketing and exporting of modern environmental technology.

Even if in the meantime at least the information supply to NGO representatives both from the IPTS office in Seville and from some Member States' governments could be significantly improved, due to lacking resources it is almost impossible for NGO representatives to cope with the huge amount of work to be done, and thus to fulfil the mandate of balanced NGO participation in a responsible way.

Proposed improvements for the future

To overcome the problems described, and in order to improve the BREF process as a whole, the following proposals are made:

?? Strengthen the formal status of NGO participation by amending the Directive 96/61/EC, Article 16 (2).

?? Strengthen the institutional basis of NGO participation, including provision of adequate resources.

?? Improve industrial representation by creating a more balanced participation of fore-runner industries and suppliers.

?? Develop clearer clearer rules for reporting in the BREFs, mainly about how "emission levels associated with BAT" are to be interpreted in terms of long-term averages, daily or half-hourly average values.

?? Use existing information on costs and benefits of improved emission abatement in the considerations on economic viability and economic efficiency (instead of giving in immediately to some actors' claims that costs would be too high).

?? Put a stronger focus on an open-minded technical information exchange in the TWGs, clarifying questions of implementation at the political level, or alternatively:

- Define clearer criteria for BAT selection which are in line with the original intentions of the IPPC Directive,
- Define transparent rules for decision-making in the TWGs,
- Develop a reasonable procedure for conflict management, ensuring an adequate "minority protection" for the one single environmental NGO representative who would otherwise be easily outvoted by the 10 or more industry representatives.

2.8 Balancing participation in Technical Working Groups: the case of the information exchange of the IPPC Directive

Dr. Christian Hey
EEB-European Environmental Bureau

Introduction

In the 1990‘s the conditions under which numerous environmental standards are prepared have changed fundamentally. In accordance with the “new harmonisation approach” model ,these are delegated from the arena of the law-making institutions to technical committees of varying composition of public and private interested parties. This was considered an appropriate method of relieving the European law-making institutions of a complex and technically challenging task. In the 1990‘s the EU has become a regular experimenting ground for the formulation of conditions, in an institutional context, for various models of the devolution of political tasks to technical forums. The Information Exchange on Best Available Techniques under the IPPC directive is a case in point.

The following paper shortly discusses the crucial success conditions for balanced participation in technical committees and presents an analysis of the IPPC directive. Some conclusions will be drawn from this.

Success conditions for the integration of the environment in technical committees

Key elements of the institutional regime that are crucial for the quality of the work of technical forums in terms of environmental policy are:

- The degree of precision and the level of the demands placed by the ecological protection objective in the mandate for the technical committee,
- The degree of representation by interested parties with environmental interests,
- The formulation of the formal and informal negotiating rules,
- And the nature of the procedural link between the political and technical levels.

This is explained in more detail in the following.

Institutionally defined principles and objectives have an important orientation function for the interested parties .With regard to the objectives, the degree to which the institutional framework clearly specifies a certain level of demands, or places the emphasis on qualified limitations is of importance. The allocation of the burden of proof and environmental rights defines whether environmental objectives or industrial objectives predominate.

High environmental objectives can be embodied to a large degree in the mandate for the technical forums by quantitative or qualitative long-term objectives (e.g. critical pollution levels not to be exceeded, observance of the recommendations of the World Health Organisation) or by procedural

principles (burden of proof reversal, worst case assumptions in the case of scientific uncertainty). Indicators for the dominance of industrial protection objectives are the mass of qualifying conditions (cost-benefit analyses, effects on competitiveness) and high requirements on the scientific proof of the hazardous effects of certain substances on man and nature before it is permitted to start to negotiate.

In respect of the representation of interested parties, particularly the relative weight and the resources of environmentally orientated coalitions of interested parties are important. These can include representatives from environmental groups or experts delegated by them, from environmental authorities or the ministry for the environment in countries with innovative environmental policy. For the most part, the discussion in the technical forums is a mixture of scientific discourse (argument) and negotiation processes (bargaining) such that both technical and also political qualifications are necessary. Environmental groups often do not have sufficient technical expertise - however for such forums this can be mobilised at ecological research institutes and consultants. If these environmental coalitions are relatively weakly represented in the forums, their potential influence is also relatively low. Personnel under-representation can, however, possibly be compensated for by a reasonable standards framework and reasonable decision rules. The appropriate representation of industrial supporting interests that can reinforce environmental coalitions in certain situations can also be of significance.

In respect of the decision rules, a differentiation can be made between minority favouring consensus rules, and forms of majority rules. Minority favouring consensus rules also enable personnel under-represented environmental coalitions to erect a blockade if their interests are not appropriately taken into account. In the theory, the principle of unanimity is not regarded as an incentive to efficiency orientated solutions, this is because the only situation in which there are no losers is in the related positive sum situations. Conversely, in practice in many technical forums a "principle of consensus" is to be found that is in effect similar to an informally operated majority rule. Consensus is what the main stream wants. Opposition against the consensus is only possible in extremely exceptional situations, if one does not want to turn oneself into the ignored outsider in the group. Also, the lack of a formal decision rule can be interpreted as an informal majority principle. "Expert judgement" then applies, a compromise negotiated beyond the official forums (cf. IPPC Directive). In technical forums in which the representation of environmental coalitions is not balanced, such rules can lead to the externalisation of problems.

Possible correction from outside is therefore important - the "shadow of the hierarchy". If such correction is missing, there is the risk of the dominance of private self-regulation. If such correction exists, e.g. through the final responsibility of the political level, the possibility of rejection or the possible recourse to law-making, then incentives are generated for the private

interested parties to take seriously, as negotiating partners, the environmental policy challengers considered to be external. The shadow of the hierarchy thus generates incentives for co-operative behaviour towards the environmental coalitions in technical forums. It is thus one of the two key institutional elements of a successful link between the political and technical level. The other important element is the quality and precision of the political mandate at the technical level.

The analysis of the conditions, in an institutional context, for devolution can thus be simplified in the framework of a 4field matrix with numerous possible combinations.

	Reasonable opportunities for influence of environmental coalitions	Bad opportunities for influence of environmental coalitions
Environmental protection objectives dominant	Sustainability	Unused opportunities
Industrial protection objectives dominant	Risk of the participation trap	Problem externalisation

The dominance of environmental protection objectives and real reasonable prospects of influence (representation + minority favouring decision rules + - ecological correction) contribute most likely to preventive negotiating strategies. If real prospects of influence are missing, then the interested parties required for the implementation of the reasonable system of objectives into practice will also be missing. Potential for suitability for the future will thus remain unused. Is there is a possibility of influence, but the system of objectives is unreasonable, the environmental interested parties in the forums would put up unsuccessful resistance in the forums without being able to effect anything substantial. The forums thus risk falling into a participation trap. In the case of overall unreasonable contextual conditions, there is the risk that the process will be controlled by interested parties who are interested in a removal or reduction in ecological standards.

BAT and the implementation of the IPPC Directive

Directive 96/61 approved in 1996 on “Integrated Pollution Prevention and Control“ (IPPC directive) formulates permit requirements for new and old industrial plants. The directive incorporates a high level of demands. Permits are intended to contribute to the avoidance of pollution, the integrated reduction of emissions in air and water, the minimisation of flows of waste, the efficient utilisation of energy and precautions in case of an incident (Art. 3). The

directive is however in its core only a procedural directive that refrains from implementing its general objectives in harmonised limits or to define other instruments of environmental policy. The implementation of the directive is performed decentrally. Member states have to enact emission limit values that are based on the "Best Available Techniques (BAT)", and also take into account the technical aspects of the business, its geographical location and local environmental aspects (Art. 9.4). This integrated, decentralised, flexible approach strongly aligned with local environmental conditions corresponds to a large degree with British permit system.

What the BAT is, is on the one hand the subject of an attempt at clarification in a comprehensive definition. On the other hand it is intended to specifically identify the BAT in the context of a process of information exchange between the governments and industry for all key industrial sectors. The objective of this information exchange process is the documentation of suitable techniques with their related environmental performance for 30 industrial sectors. The result of the process of information exchange is recorded in so-called "BREFS" (Best Available Technique Reference Documents) and is intended to be used by the national approval authorities as the information base for the definition of standards in their respective approvals. This exchange of information is the remnant of the harmonised emission control originally supported by Germany. The directive thus represents a compromise between the British environmental quality and the German emission control approach Part of this compromise is, however, that the conflict between the two approaches is shifted to the technical level.

This can already be seen in a detailed analysis of the normative reference framework for the information exchange process, the definition of BAT. The comprehensive definition with numerous qualifying comments raises more questions than actual clarification. In particular the definition of "available" significantly limits the level of environmental policy demands. Through the conditions for commercial justifiability and the cost/benefit relationship, the British philosophy orientated towards local environmental conditions has again crept in. In this way the level of environmental policy demands becomes itself the subject of a political confrontation in forums set up for the clarification of technical questions. Some member states and the industries involved expect a diffuse result from the information exchange process with a large range of recommended techniques and emission limits. The environmental orientated interested parties on the other hand expect an ambitious European standard for innovative techniques.

The process of information exchange was overshadowed for several years by the conflict on the content of the IPPC directive. Only in February 1999 was a compromise formulation reached that makes it clear that the result of the information exchange process does neither lie in a large range of techniques nor in a particularly ambitious standard. Using this "clarification", made in 1999, of the level of the environmental policy demands in the direction of an above

average, but not best possible environmental performance of BAT, a normative framework for the further work on the information exchange process has been created.

Institutionally, the process of information exchange takes place at several levels. For the clarification of political and strategic questions, an "Information Exchange Forum" (IEF) has been set up that comprises representatives from the member states, industrial umbrella organisations, the European Commission and the European Environmental Bureau. The actual exchange of information takes place at the level of the technical working groups. The composition of these technical working groups is formally pluralistic and informally selective. Formally experts from environmental groups are invited in the same way as experts from the respective sectors of industry. In reality, however, the European Environmental Bureau (EEB) only achieves partial staffing of the technical working groups with experts, as the work is on a voluntary basis and the EEB and its members lack the resources to pay the customary market fees for experts. Since 1999 the EEB has however set up a limited budget for experts from the general EU support. Representatives from industrial plant builders are just as little formally involved in the process as representatives from science. This has been justified with the view that, under the pressure from its users and customers, plant builders are hardly in the position to talk about technical options and costs. Informally, plant builders are however consulted. The infrastructure for the information exchange process is provided by the European IPPC Bureau (EIPPCB) in Seville. This supports an office with one expert per sector who prepares draft reports based on the information provided and the results of the expert's own research. As the process of information exchange is generally under-financed, the EIPPCB is dependent on support from the member states. It can be seen that some member states have recognised the strategic role of the specialists in the EIPPCB and dispatch such to Seville. With the dispatch of experts, countries with ambitious environmental policy have the opportunity to influence the quality of the BREFS. Representatives of the member states, partially from the ministry for the environment and partially from the ministry for economic affairs, are also involved in the information exchange process. An important role as moderator is mostly also played by the representative from the European Commission. From the side of industry, there are reports of, in some cases, dozens of participants from the affected sector. The affected branches of industry are investing in some cases considerable resources in influencing the process. In this way they demonstrate a willingness to co-operate, however they are also not deterred from making strong threats to stop the work. The exchange of information process is thus pluralistic, however in actual fact between unequally equipped partners. The balance of the interests represented in each case is rather random and depends on the ability of the involved interested parties in the affected industrial sector to mobilise support.

There is also an institutionalisation deficit in respect of procedural aspects. The information exchange process does not include any formal conflict resolution and decision mechanisms. This deficit can be traced to the unrealistic

conception of the information exchange process as a purely technical data collection process. In general, the informal consensus principle is adopted, that is, in effect, a majority rule. If, under these conditions, it is nevertheless not possible to reach agreement, compromise rules are applied: The reference values for emissions based on BAT are, e.g., the result of the mean of that which the experts consider possible ("bazaar"). Finally there is the option of recording differing opinion in a footnote. Sometimes the EIPPC Bureau also further worsens the figure in agreement with the affected industries. This, however, not unusually triggers political conflicts.

Political conflicts at the working group level can also be resolved at the IEF level, which, however, also does not have a formal decision procedure. At this level negotiations are more along the lines of the principle of informal pressure to agree, the rule of "no sustained opposition". The Commission and the EIPPCB often have a pivotal role in identifying and determining what they consider as "consensus".

As the Commission publishes the results of the information exchange in the EU Official Journal, formally it has a political recall facility that it, however, does not in reality consider using - the Commission does not want to endanger the overall process.

The process thus takes place under conditions of high time pressure, significant shortage of resources for the representatives of public interests, an informal pressure to agree, and in an institutional vacuum that does not include any adequate rules for a balanced representation of interests and allocation conflicts. The formally reasonable offer to the environmental groups of participation thus changes into an informally rather unreasonable institutional framework. The results of the information exchange process depend on a series of random groups of conditions.

Conclusions

The IPPC directive contains ambitious environmental objectives; the information exchange process on BAT is, on the other hand, based on only a moderate level of environmental protection. A policy for balancing the resource differences between non-government and private interested parties is only in the early stages. The conflict solution mechanisms are insufficiently formalised and opaque. Under these conditions, environmental interested parties have prospects of influence; these are however in need of improvement. The unclear normative reference framework provides repeated impetus for political conflicts over the level of the environmental policy demands sought.

A potential solution to compensate for the lack of decision-making rules might be, to give the Art. 19 Committee a say in adopting the BREFS. Then the information exchange would take place in the shadow of a comitology procedure, which has clear decision-making rules. Political conflicts on the level

of ambition of individual BREFS – which are anavoidable due to the many subjective judgements and decisions to be taken in the process – can then be solved by a widely accepted procedure.

Rules of procedure should also be amended in order to give minority positions a proper standing and to draw a clearer borderline between information exchange and decisions of a political dimension. In the latter either Member States should have a clear say or a tiered approach should be chosen, that lack of consensus requires a decision at the next level (e.g. IEF or Committee). Consensus should be defined in a way that the opinion of minorities count.

Important is also that the ressources for the information exchange process are extended in order to allow the participating representatives of public interests (member states, environmental NGO´s, EIPPCB) verify information and to collect information not provided by the respective industries.

A forthcoming revision of the IPPC-Directive should give environmental NGO´s a clear legal standing. It should also give better guidance on the level of protection intended by the BAT approach.

Note: This is an extract of a forthcoming EEB Publication on: Towards Balancing Participation: A Report on Devolution, Technical Committees and the New Approach in EU Environmental Policies: The cases of Standardisation, Chemicals Control, IPPC and Clean Air Policies in a Comparative Perspective, April 2000

Also published in German in: Prittwitz, Volker von: Institutionelle Arrangements in der Umweltpolitik, Leske und Budrich, April 2000

Session III:
The Aims of the Sevilla-Process

3.1 European innovation and exchange of information about BAT

Magnus Gislev[?] ,
Environment Directorate-General,
European Commission

[?] The content of this speech reflects the personal views of M. Gislev, desk officer for the IPPC Directive at the European Commission, and not necessarily those of the European Commission or the European Court of Justice.

The role of 'BAT' as a promoter of innovation in Europe

The most fundamental element of integrated pollution prevention and control (IPPC) is the concept of Best Available Techniques (BAT) as defined in the IPPC Directive. For all the polluting point sources covered by the Directive, appropriate preventive measures must be taken, in particular through application of BAT.

However, in order to ensure flexibility and to encourage technological and operational innovations, the Directive expressly forbids authorities to prescribe the use of any specific BAT in permits issued to operators. Instead, permits must contain conditions, such as emission limit values, which are sufficient to ensure that BAT requirements are met taking account of the particular characteristics and circumstances of the installation. This flexible approach recognises the fact that different techniques can be combined to achieve equivalent environmental performance. One of the purposes of IPPC is thus to promote innovation in Europe, thereby contributing to technological and economic development.

The starting point of the IPPC approach is that continuous process innovation, in combination with resource management and enforcement of environmental quality standards, will lead to both sustainable development and economic growth.

The importance of technological development for competitiveness is generally accepted by the scientific community, industry and policy-makers. Consequently, the European Community and its Member States seek to develop policy instruments that foster innovation. In parallel, the scientific community and industry invest large sums in pursuit of technological progress. Over the last decades, pollution control and cleaner technology have increasingly become major factors in R&D programmes. Originally, environment-related investments were mainly the result of regulatory requirements. Nowadays, it is increasingly consumer demand that drives companies (and thus the focus is gradually shifting to the environmental performance of products rather than processes). Development projects can either be primarily motivated by environmental considerations or only partially so, but today, projects that would cause increased pollution are usually discontinued at an early stage.

These strong trends also imply that if a competent authority chooses to set permit conditions that are weaker than BAT based conditions, it may well be that it does the company and the region where it is located a disservice in the longer run, since it hinders natural and desirable modernisation and structural transformation.

In the context of BAT and innovation, the importance of pollution prevention (also called primary or process-integrated measures) should be highlighted. A weakness in traditional environmental regulation was the over-emphasis on end-of-pipe abatement techniques (also called secondary measures). As

opposed to most end-of-pipe measures, pollution prevention is not only good for the environment, but its development and implementation is also helped by the fact that it often represents a profitable measure, because the generation of pollution and waste, including heat, reveals an inefficiency in the production process. (If pollution is controlled by end-of-pipe abatement, the economic cost of an inefficient process is supplemented by the additional cost of the abatement. If instead, pollution prevention and resource efficiency are integrated into the entire production process, the operator can often experience the double gain of saving on raw materials and energy and avoiding the need for costly abatement technologies.)

From a supply-side perspective, the regulatory requirement to apply BAT is essential if the European eco-industry is to see strong growth and fight off global competition (from countries such as the United States). The core eco-industry in the European Union represents about half of the world market. This world market is expected to grow to 300 billion Euros by the year 2000 and to around 570 billion Euros by 2010. It comprises

- air pollution control,
- water and waste water treatment,
- waste management,
- contaminated land treatment,
- noise and vibration control,
- environmental monitoring and
- environmental consultancy/services.

The BAT approach should also be seen as a tool for creating a more level playing field in Europe and promoting economic and social cohesion. According to the Directive, the exchange of information at EU level about best available techniques will help to redress technological imbalances in the Union and promote the world-wide dissemination of techniques used in the Union.

The exchange of information on BAT

Article 16(2) of the IPPC Directive requires the Commission to "organise an exchange of information between Member States and the industries concerned on best available techniques, associated monitoring, and developments in them" and to publish the results of this information exchange.

The information published in this way is one of the considerations to be taken into account by permitting authorities when they determine BAT for a particular installation, and will thus have a considerable influence on the way in which the IPPC Directive is implemented. The active involvement of industry at all stages is the key to making the information exchange a success. A proactive, environmentally conscious industry has nothing to fear and everything to gain

from informing the authorities and the public and thus avoiding misconceptions and distrust which can lead to bad public relations.

The purpose of the information exchange is to assist Member States and competent authorities when determining BAT for specific installations. The published results will take the form of BAT Reference Documents (BREFs) for each sector covered by the Directive. In addition, a number of cross-sectoral issues have been identified as worthy of particular attention and will result in "horizontal" reference documents. Each BREF will contain a list of techniques which are considered to qualify as BAT, along with the environmental performance that they can achieve. Of course, these are not to be regarded as exclusive lists of techniques to be applied in every installation - this would be in contradiction with the requirement not to prescribe particular techniques. Rather, the idea of listing techniques and specifying reference values for environmental performance is to provide benchmarks that will assist the authorities in determining BAT.

The European Commission has set an ambitious goal for this process: we aspire to produce high-quality reference documents that will exert a kind of a magnetic force on EU Member States and their authorities so that they will really *want* to use them when determining BAT and BAT-based permit conditions, apart from their legal obligation to do so (because, regrettably, legal obligations in the environmental field have not always been strictly honoured by Member States).

How work was organised

In the past, there had been previous information exchanges on BAT concerning both discharges to water (under Directive 76/464/EEC) and emissions to air (under Directive 84/360/EEC). The outcome was a series of BAT Technical Notes which identified the technology or technologies that could be considered as 'best'. The notes were drafted by sectoral working groups with the contribution of industrial representatives and the final approval decisions were taken by consensus in a non-regulatory committee chaired by the Commission and comprising Member State nationals and industry. The Member State nationals in the committee essentially had the status of national experts who did not formally represent their national administration. The Commission was responsible for the co-ordination and it was assisted by a technical consultant for each working group.

In 1995, one year before the IPPC Directive was adopted, the European Commission decided to propose a similar two-level system. The first level would be the expert level, whereas the second would have a central co-ordinating function in which each member would have a true representative role. Apart from EU Member States and industry, environmental NGOs would also be invited to take part in the information exchange.

Right from the beginning, the Commission was of the view that, since its obligation would be to report on the exchange of information, it did not necessarily need agreement or approval of Member States (or industry or environmental NGOs) in issuing the reference document. The purpose of the meetings at the second level would be to oversee the process and ensure the full exchange of opinions with the view to reaching consensus, but if this was to prove unrealistic, the Commission would issue its document reflecting the outstanding disagreements. Final responsibility for publication of the BREFs would rest with the Commission.

The substantial work would be done within working groups for each sector, largely organised and run by a special bureau, possibly to be founded at the Commission's Institute for Prospective Technological Studies (the European IPPC Bureau). Such a cooperation was deemed appropriate since the IPTS was providing technical support to other parts of the Commission and in particular support to "the management of change" enhancing industrial innovation and competitiveness.

Once the Directive was adopted, the Information Exchange Forum had its first meeting in December 1996 (with EU Members State delegations, a UNICE delegation and representatives from the European Environmental Bureau and EFTA countries). Among the issues discussed was a draft multi-annual work programme covering more than 30 BREFs each to be completed in one year's time. The European IPPC Bureau was also established in December that year.

How the system has developed

The Sevilla process started when the first technical working group meetings were held in May 1997. It has to be admitted that the information exchange experienced some teething problems in the beginning, such as insufficient input to the process in particular from Member State experts. It should be stressed that throughout the exercise this has been a dynamic learning process, where previous decisions have been frequently adjusted in the light of experience gained. A good example of this is the work programme, where activities have been merged or cancelled and where the starting dates have either been brought forward or postponed for various kinds of reasons.
These are some of the most significant developments in the exchange of information so far:

- In 1998, it was decided that all drafts for consultation would be available to the public on the Internet.
- In 1999, a decision was made to produce a BREF on economic and cross-media issues (February 1998: workshop on cross-media aspects in Berlin, February 2000: workshop on economic aspects in Brussels).
- Early last year, it was formally recognised that one year to complete each BREF was not a realistic target and a new time scale of two years was set.

- Electronic communication using the Internet has gradually become more advanced and better exploited by members of the working groups.
- The European IPPC Bureau has grown steadily and it now employs 16 people.
- At the last meeting of the Information Exchange Forum in February 2000, a standardised BREF preface clarifying the context and status of BREFs was fixed and the two first BREFs (Cement and Lime, Iron and Steel) were finally completed.

Future developments (?)

At the moment, no major operational changes are planned. We hope to be able to finalise six more BREFs this year. Those involved in the information exchange have now gained more experience so, at least in theory, work should run more and more smoothly.

Naturally, it will be interesting to see to what extent it will be possible to reach broad consensus and avoid split views in the BREFs. While split views generally take away some of the value of the BREFs, it is likely that watered-down political compromises would have a worse effect on the credibility of the EU's BAT determination, which is intended to be a predominantly technical (and not a political) process.

In the medium term, a new work programme for the updating of the first generation of BREFs will need to be established. Finally, in the first half of 2004, the whole directive will be evaluated and possibly reviewed as the Commission analyses and presents the replies of Member States to the first implementation questionnaire.

In conclusion, this has been an evolutionary process but the learning curve is now flattening out to the benefit of productivity. In 2004, we will have a first good idea of how the EU Member States perceive the quality of the BREFs and the degree of importance they attach to them within their national permitting systems.

3.2 The European IPPC Bureau; what is it, where is it and what does it do.

Dr. Per Sørup,
Institute for Prospective Technological Studies,
European Commission, Joint Research Centre

What is the EIPPCB?

The EIPPCB can be seen from three angles.

1. Firstly it is a project identified within the fifth framework program of the European Commission to carry out the technical work required by our colleagues in the Commission Services and in particular those of DGs Environment and Enterprise.
2. Secondly the EIPPCB is a unique group of people, each an expert in his or her own right recruited to work within the IPTS on the EIPPCB project. Their individual expertise on process engineering and environmental permitting supplement their specific expertise on one or more of the subject work areas being covered by the EIPPCB to create a multi-national team of people dedicated to producing quality reference documents to assist the efficient and effective implementation of the IPPC Directive.
3. Thirdly from the view of all our experts in all our Technical Working Groups the EIPPCB is a focal point for all relevant knowledge and information to be discussed at a technical level with other renowned experts. This is the catalytic function of the EIPPCB although few would claim that the catalyst is unchanged in the process itself. The staff are a mix of longer term Commission employees and Detached National Experts who rotate on a shorter term basis bringing specific expertise into the EIPPCB team and eventually leaving to return to their home employer with a unique European experience to add to their CV and to the expertise of their employer.

Where is the EIPPCB?

Geographically everyone will know from the title of the conference if they didn't know already that the EIPPCB is located in the beautiful city of Sevilla, capital of Andalucia. More importantly the EIPPCB is located within the European Commission's Joint Research Center in the Institute for Prospective Technological Studies (IPTS), Unit Technologies for Sustainable Development. IPTS was established in 1994 with the mandate to provide prospective policy support to the policy-making process of the European Union. IPTS maintains the European Science and Technology Observatory (ESTO network) which links together more than 30 renowned research orientated organisations for the benefit of the European Community. Having the EIPPCB within the IPTS provides excellent opportunities for synergy with other projects undertaken in IPTS which include for example work on global energy and environmental issues, and competitiveness of industry.

What does the EIPPCB do?

The tasks undertaken by the EIPPCB fall into a number of categories.

1. All meetings of the Technical Working Groups constituted under the umbrella of the information exchange are organised and run by the EIPPCB. As one would expect this includes the preparatory paperwork, the technical presentations, the administrative arrangements and the records of the meetings. Normally only two plenary TWG meetings are held, one towards the beginning of the work of a TWG and one towards the final drafting stage.
2. The individual staff in the EIPPCB each have one or more subject areas on which to focus. Thus each EIPPCB expert member acts as a leader of the work of one or more TWG, communicating on a day to day basis with their respective TWG members to collect and validate information and maintain momentum in the progressing work both in terms of the TWG as a whole and where the TWG spawns sub-groups for specific subjects.
3. The EIPPCB receives and catalogues all the technical background material submitted to the TWGs which is then accessible to visitors to the EIPPCB offices. The EIPPCB cannot act as a library service for these background documents for many reasons including copyright.
4. A major task for the EIPPCB is to create the first draft of each BREF. It is not simply a cut and paste exercise from the submissions received, it is a case of validating the statements and data as far as possible and distilling the essential content of a BREF from the submitted information. In particular the EIPPCB seek to avoid political messages and focus instead on sound technical information and fact. This aspect is crucial to the technical credibility of the BREFs produced so they will withstand scrutiny at all levels.
5. To enhance the accuracy and credibility of the drafts another major step in the drafting is to prepare and send the draft out to the TWG for further validation and comments. In the pursuit of transparency the EIPPCB also puts all its draft BREFs onto the internet site for anyone in the world to view.
6. Draft and maintain a record of these formal communications. The TWG and any support groups established behind individual TWG members are recognised as experts so their views are all important to the successful outcome of the exercise. Above all, this is an exchange of information between the TWG members and here the EIPPCB acts as a catalyst to promote such exchange of information in the TWGs.
7. This logically leads to a redrafting of the document itself in light of comments made and further submissions of information. Here it is also quite logical that the comments which are well argued and explained are those which are most likely to result in changes to the draft BREF.

Comments such as „the paragraph is wrong“ or „I disagree“ cannot be expected to receive much sympathy without some explanation as to what is wrong and why the disagreement. Preferably in both cases an alternative solution is proposed and also explained. This whole cycle of drafting – consultation and redrafting is repeated at least twice and is extremely time consuming. Ultimately late information cannot generally be included in a BREF due to the time it would take to validate and consult on the information. Equally this exercise is not a form of committee negotiation but an exchange of technical information which should lead to sound conclusions based upon that information.

8. Validation of information and data is crucial to product quality in the case of BREFs. This is achieved by checking different sources, through the consultation procedures and through a number of selected site visits where the EIPPCB expert can discuss directly with operators and suppliers on key issues. Most of the EIPPCB staff are or have been inspectors or permit writers and seeing the techniques applied for real with the opportunity to talk with the operators is proving invaluable.

9. Of course it is an important task of the EIPPCB to report regularly to our Commission customers and to the IEF with the eventual presentation of each final draft BREF to the IEF for scrutiny, questioning and endorsement. The EIPPCB and each TWG is tasked with producing a BREF on specific subjects and the IEF need to maintain an overview of the whole exercise if the product BREFs are to be fully endorsed and accepted by all concerned when they are finished. Note that we use the words endorsed and accepted rather than agreed because full agreement on all points of detail is somewhat over optimistic.

10. In addition to the core work of creating BREFs the EIPPCB receives a constant stream of general enquiries from people worldwide interested in the technical work and the IPPC Directive. Whilst it is gratifying that the world recognises the unique expertise of the EIPPCB team, our resources are limited and work focuses on the BREFs and the work of the TWGs. However as shown by this conference we are in the business of promoting the principles of IPPC, BAT and BREFs so you will find the EIPPCB participating in some shape or form at a great many such events.

11. Partly in order to handle the vast amount of information and partly to ease the problems of communication over distance and time zones, the EIPPCB and IPTS use the internet as a key communications tool. The EIPPCB homepage is maintained with some general information about IPPC and the work program, the text of the Directive, staff contact details and of course the draft BREFs themselves. IPTS has advanced informatics systems constantly supported by our own IT specialists but unfortunately the web suffers from its own success. There are elements of web performance beyond control of any single web user and we have even gone to the extent of providing a user guide specifically to all our TWG members but also available to casual website visitors to assist the transfer

of information over the internet. We are constantly exploiting new systems and operating practices in light of our experiences with handling such vast amounts of information.

Conclusion

From this presentation I hope you will see that the EIPPCB created by the IPTS is a centre of technical excellence staffed by highly motivated individuals, some of whom you will shortly hear from individually. The EIPPCB builds on the excellence of IPTS and the series of BREFs are something we can feel proud of.

Session IV:
Sevilla Works

4.1 BAT reference documents: what are they and what are they not

Don Litten,
European IPPC Bureau

Introduction

Council Directive 96/61/EC on integrated pollution prevention and control requires Member States to regulate certain industrial activities, as laid down in Annex 1 to the Directive, by means of operating permits with conditions therein based upon best available techniques (BAT). Article 2(11) provides the definition of BAT and Article 16(2) requires the Commission to organise an exchange of information between Member States and the industries concerned on BAT, associated monitoring and developments in them. Every three years the Commission shall publish the results of the exchanges of information. Information published pursuant to Article 16(2) shall be taken into account when determining BAT in specific cases. The Commission established the Information Exchange Forum (IEF) and the European IPPC Bureau (EIPPCB). The IEF conceived the concept of BAT reference documents to reflect the information exchange and continue to review progress of the work. This paper looks at the series of BREFs foreseen within the work program of the EIPPCB and seeks to enhance understanding of them.

What BREFs are not

- BREFs are not prescriptive. They do not set nor propose emission limit values either at sector, national, regional, local or site specific level.
- They do not provide any legal interpretation of the Directive itself.
- They do not remove the obligation on Member States to fully implement the provisions of the Directive and ensure, through their permitting system, a high level of protection for the environment as whole.
- They cannot be exhaustive nor can they fully take account of all local conditions in determining BAT.
- Thus they cannot determine BAT at specific (national, regional, local) levels.

What BREFS are

"BREF" stands for BAT reference document. This phrase does not come from the Directive but was created by the IEF. BAT in a BREF is, of course, BAT according to the IPPC Directive.

The series of BREFs consists of "vertical" sector specific BREFs addressing one or more industrial activities listed in Annex 1 to the directive and "horizontal" subject BREFs addressing IPPC issues across industry sectors. These horizontal BREFs do not stem from named activities in Annex 1 but from the general approach of IPPC within the Directive itself.

They represent a collection of information for the guidance of decision makers involved in implementation of the IPPC Directive.

They are addressed at a very wide audience such as :

- Industry operators needing to apply for a permit
- Permit writers in the competent authorities of Member States (and other States).
- Policy makers involved generally in environmental regulation and IPPC in particular.
- Society at large

In each of these categories there are varying levels of expertise. Thus in order to inform the breadth of such an audience and be effective in assisting the implementation of the IPPC Directive, the BREFs include more information than any individual reader should need.

Vertical BREFs are structured according to a general outline which will be tailored to fit the specific industry sector under discussion but will include the following elements:

- A (standard) preface describes the structure of the document, the legislative context, the way in which the document was generated (e.g. how information was collected and assessed) and how it can be used.
- General information is given about the industry addressed by the BREF in terms of numbers of installations, size, geographical distribution, production capacity and economics. An overview of the structure and nature of the sector and the key environmental issues for the sector.
- A section entitled applied processes and techniques briefly describes the production processes and techniques currently applied in the sector(s) covered by the BREF. Not a text book but enough information to give the reader a good appreciation of the steps involved in the industrial process from raw material receipt to products.
- The current emission and consumption levels are reported as far as possible for the overall process and for sub-processes. As far as possible reporting the actual situation covering consumption of raw materials and energy; emissions to all environmental media – land, air and water – but including some quantification of input and output streams for sub-processes within the overall process to highlight the environmental significance of parts of the overall process and to open the discussion on options for recycling and re-use of certain residues, by-products, heat, water etc..
- Techniques to consider in the determination of BAT. A structured section presenting, technique by technique, options to obtain good environmental performance in the carrying out of the activities involved. Not presenting any technique as de facto economically or technically viable for all installations but discussing each technique in advance of determining BAT.
- A brief description of the technique. Noting that a technique may be an additional piece of equipment or the way the process is designed or operated. A technique can be the way the equipment is maintained or simply an operating procedure.

- Some assessment of the environmental benefits to be gained through implementing the technique. Usually expressed in terms of a potential reduction in emissions but including any of the considerations listed in Annex IV to the Directive.
- Any cross media issues to note such as increased use of energy or reduction in waste generation. Including here information on possible whole environment effects, local, regional, global etc. Strictly not always cross media but including different effects within the same medium such as balancing NOx and CO both to air where, often, the reduction of one parameter must result in the increase of the other.
- An important qualification in terms of the applicability of the technique. Can it be readily retro-fitted to any installation or is it really only feasible to install on a new plant. Is it only relevant for certain cases ?
- Economic information on costs, savings, both capital and running costs, and other ways in which the technique may impact upon the economy of the process. Necessarily only an indication of the economics of a technique due to the site specific nature of most precise cost data.
- Reference plants and more additional information giving some idea of how widespread the technique is in use.
- An important step before trying to determine BAT in a BREF is to understand the driving force behind historical implementation of each technique. Some techniques have been implemented because of a special lack of water, for example or are in response to a special financial regime at the plant in question.
- The BAT conclusions stem from the information presented earlier and here is the crucial element, all inherent to the IPPC definition of BAT, of balancing any cross media effects and taking account of costs, benefits, technical and economic viability. Annex IV to the Directive lists a number of considerations to be taken into account when determining BAT and this provides a decision framework in this respect. Recognising that a BREF cannot take account of all local circumstances, the document can only conclude on BAT in a general sense for the sector as a whole as a reference point to assist the determination of BAT in specific cases, such as in national rules or individual permits. Usually expressed as a range of emission and consumption levels associated with the use of BAT where BAT is a combination of techniques considered as a package to represent the concept under IPPC. The range reflects a benchmark level of environmental performance. The very best performers could be expected to lie within the better part of the range, with exceptional performers already driven by special reasons to do even better. Those not achieving within the range associated with this general BAT could normally improve their performance towards the range but the amount of improvement required and the rate at which improvement is required is a matter for the Member States and their authorities.

?? A section on emerging techniques is meant to offer some information on novel developments in the sector and act as a flag to future work looking to review any BREF. It may also act to stimulate research in these areas as may the section on conclusions and recommendations which serves to sum up the information exchange exercise and highlight strengths and weaknesses which could be improved at some later date. The phrase of emerging techniques does not stem from the Directive but relates to possible developments in BAT.

?? An executive summary will serve a special purpose in the procedure for adoption and publication by the Commission. It cannot summarise the whole BREF in a way which all the useful information is included therefore by its very nature it has to summarise the BREF and encourage the reader to go into the bulk of the BREF to read the whole story.

With such a framework for all BREFs it is intended to provide information consistent with the aims and objectives of IPPC but focussed on the subject matter of each BREF. The horizontal BREFs still try to follow the elements of the normal outline which are relevant to their subject and some are able to use far more of the vertical framework than others. The concept of BAT in a general sense may fit far better, for example when addressing the subject of storage of chemicals than that of monitoring.

The series of vertical and horizontal BREFs could be seen to make up a matrix of information to reduce the amount of duplication between BREFs. In the same way it is important to note that vertical BREFs can have pragmatic boundaries drawn between them when there is risk of overlap between two TWGs and their BREFs.

An example of this is how the Large Volume Organic Chemical manufacturing and Refineries BREFs resolve the situation. A refinery by definition will carry out the separation of crude oil into fractions. Then it is quite common to use some products of the separation processes as feedstock in manufacturing organic chemicals in similar processes to those at a chemicals manufacturing plant not associated with a refinery. For the purposes of the BREFs an imaginary boundary is created where upstream of the steam cracker is handled by one BREF – Refineries - with the steam cracker and downstream processes by another – L.V. Organic Chemicals. It must be stressed that in no way should this be seen to create a real boundary in a refinery where none exists. It is merely an efficient way to develop the BREFs as part of a series with different BREFs standing quite properly side by side.

Another aspect to stress is that a BREF covers both the core Annex 1 activities and the directly associated activities which commonly would be expected to be included in a IPPC permit. The fact that these directly associated activities are described in a BREF and BAT conclusions may be drawn referring to them does not mean that the directly associated activity itself is somehow brought under IPPC where it is carried on elsewhere not associated with an Annex 1 activity.

It is worth highlighting why a BREF can only address BAT in some general sense. The setting of BAT-based permit conditions must, according to the IPPC Directive take account of the technical characteristics of the installation and the local environmental conditions. Additionally the setting of any permit conditions would normally be done bearing in mind the consequences of non-compliance and the likely enforcement of conditions in law. These elements are not harmonised across the Community and therefore must be respected in offering information to guide those setting conditions within their own permit framework. The Directive provides much flexibility for Member States to implement IPPC in their own way and the work of TWGs and the BREFs must not interfere with this principle of subsidiarity.

Annex IV to the Directive, which refers to determining BAT generally or in specific cases, includes the consideration of the length of time needed to introduce BAT. This seems to underline the determination of BAT in specific cases, on the basis of BAT in a general sense and the technical characteristics of the installation which may dictate technical and economic viability of upgrading an installation. This time to introduce BAT is not related to the implementation of the Directive which requires that by October 2007 at the latest all Annex 1 activities are covered by a permit. Often these two aspects are confused. In many BREFs the TWG has identified as BAT a technique which for technical and economic reasons can only be fitted at a time of major rebuild of plant. With some processes operating continuously for 10 or more years it then follows that, in this case, BAT in the general sense is introducing the particular technique at the first opportunity afforded by the rebuilding cycle. On the other hand, or course there are techniques identified as BAT which can be technically and economically fitted very quickly once the regulatory driver of the permit requires it.

BREFs are large and complex documents and it is impossible to present them in detail here. However, by way of real world examples the following presentations from BREF authors are intended to present how some of the more common issues are dealt with. In this way we hope to show how the BREFs as a series are technically sound and a good foundation to assist the efficient implementation of the IPPC Directive. The individual papers and presentations to follow this will address a number of issues such as :

- How BAT in a general sense has been determined;
- How BREFs are structured to reflect the industry sector;
- Where there are or are not true alternative process options for the production of the same products from the same raw materials;
- How BAT can be expressed sometimes as associated emission and consumption levels and sometimes as good practice;
- How the economic elements of BAT have been handled and how the environment has been considered as a whole;

- How a BREF can inform about a range of installations with various technical characteristics such as size or age;
- The various interfaces between vertical and horizontal BREFs; and
- How varying degrees of consensus in TWGs are dealt with.

Conclusion

BREFs are the results of the information exchange carried out under Article 16(2) of Directive 96/61/EC. They are structured within one framework for BREFs but each is focussed upon a specific industry sector or horizontal topic. They are compiled as technical reference documents from information submitted by Member States and Industry as verified by the EIPPCB and the respective TWG. They neither prescribe standards nor techniques which must be used but they offer quality information for the guidance of those who have to make specific decisions on BAT in implementing the IPPC Directive.

Session V:
From Concept to Reality

5.1 BREF on the Production of Iron and Steel - conclusion on BAT

Dr. Harald Schoenberger,
Regional State Governmental Office Freiburg
(Formerly European IPPC Bureau)

Introduction

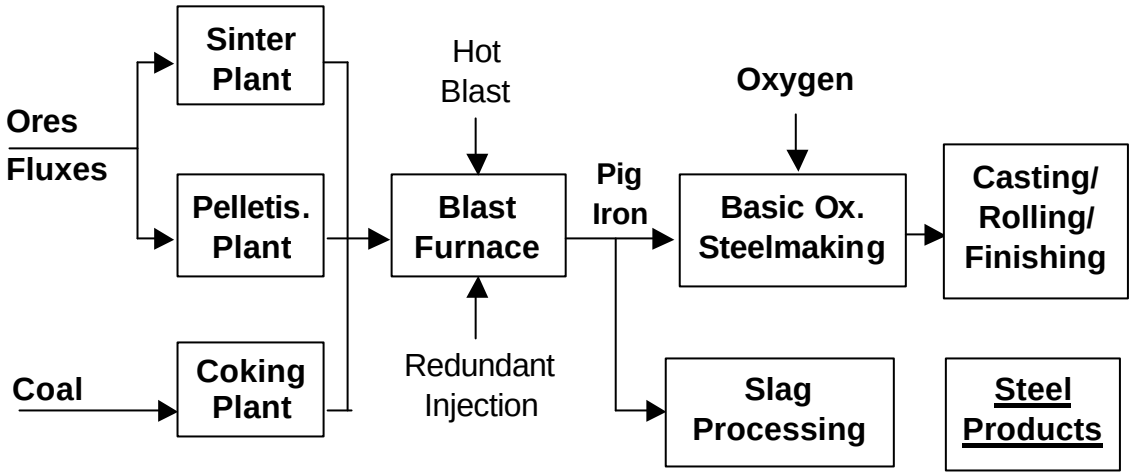
The final draft BREF on the production of Iron and Steel (I&S-BREF) is available since January 2000 [EC, 2000], and has been adopted at the 7. Meeting of the Information Exchange Forum (IEF) on 28/29 February 2000. In addition, during this meeting an official hand-over from the European IPPC Bureau (EIPPCB) to DG Environment of the European Commission took place. Thus the I&S-BREF and the BREF on the Production of Cement and Lime are the first final products of the so-called „Sevilla-Process".

The I&S-BREF comprises about 350 pages and contains detailed information on most environmental aspects of the sector. This presentation addresses how the BREF structure reflects the industry structure and, by hand of five examples, how conclusions on BAT have been developed.

The sector iron and steel industry

The scope of BREF covers the processes involved in the production of iron and steel in integrated steelworks. Following main production steps are included: sinter plants, pelletisation plants, coke oven plants, blast furnaces and basic oxygen steelmaking incl. casting (figure 1).

Table 1: Simplified flow sheet illustrating the basic process sequence of integrated steelwork



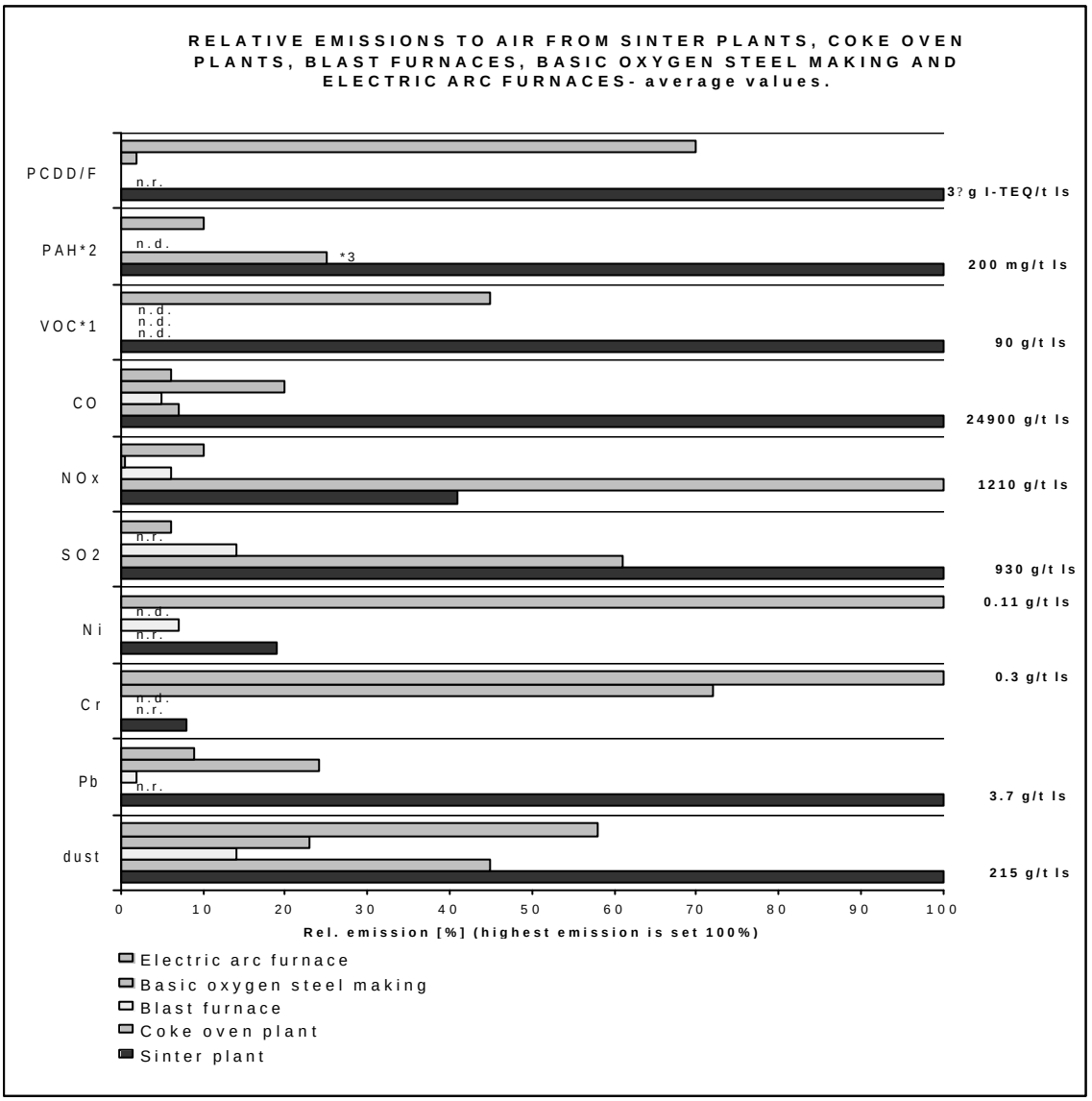
Not included is cold and hot rolling; these processes are covered by the BREF Ferrous Metal Processing. In addition electric steelmaking and casting (also including rolling) are within the scope. The sector is characterised by large scaled industries and relatively small numbers of installations. In the EU 15 there are 42 integrated steelworks and 246 electric arc furnaces.

Environmental relevance of the iron and steel industry

The iron and steel industry is highly intensive both in materials and energy. In 1995 for the production of 155.8 Mt of crude steel the total input of iron ore, scrap, coal, lime, limestone, fuel oil, gas oil and additives has been 316.5 Mt; thereby water and gaseous inputs are not considered. That means, that about half of the input results in crude steel only and the other half are solid residues/by-products and off gases.

Air pollution remains to be the most important issue of this sector. In integrated steelworks sinter plants are dominating the overall emissions to air for most pollutants, followed by coke-oven plants (figure 2). Regarding copper, nickel and PCDD/F emissions to air from electric arc furnaces are also of significant relevance.

Figure 2: Relative emissions to air of selected pollutants from sinter plants, coke oven plants, blast furnaces, basic oxygen steelmaking and from electric steelmaking


RELATIVE EMISSIONS TO AIR FROM SINTER PLANTS, COKE OVEN PLANTS, BLAST FURNACES, BASIC OXYGEN STEEL MAKING AND ELECTRIC ARC FURNACES- average values.
PCDD/F
n.r.
3? g I-TEQ/t ls
PAH*2
n.d.
*3
200 mg/t ls
VOC*1
n.d.
n.d.
n.d.
90 g/t ls
CO
24900 g/t ls
NOx
1210 g/t ls
SO2
n.r.
930 g/t ls
Ni
n.d.
n.r.
0.11 g/t ls
Cr
n.d.
n.r.
0.3 g/t ls
Pb
n.r.
3.7 g/t ls
dust
215 g/t ls
0 10 20 30 40 50 60 70 80 90 100
Rel. emission [%] (highest emission is set 100%)
Electric arc furnace
Basic oxygen steel making
Blast furnace
Coke oven plant
Sinter plant

Structure of the I&S-BREF

The structure of the I&F-BREF reflects both the main installations of integrated steelworks and the material flow (see figure 1). The direct dependencies of sinter plants, pelletisation plants, coke oven plants, blast furnaces and basic oxygen steelmaking are relatively clearly defined. These plants are big units. Usually they are permitted as such. So it has been decided to provide the information 'en bloc' for these plants, that means the I&S-BREF contains for the above mentioned plants an information package covering present emission and consumption levels, techniques to consider in the determination of BAT, conclusions and emerging techniques. The same is for presenting information on electric steelmaking.

Although the I&S-BREF is structured plant-wise in the described way the conclusions on BAT for them have been developed with an integrated view of the whole steelworks. Thereby the "big issues" were in the foreground of discussion such as

- residual dust and PCDD/F content in off gases from sinter plants,
- maintenance programme and low emission operation of coke oven plants as well as coke oven desulphurisation and coke dry quenching,
- cast house de-dusting of blast furnaces,
- BOF gas recovery and secondary de-dusting of basic oxygen steelmaking,
- residual dust and PCDD/F content in off gases from electric arc furnaces

In this way the I&S-BREF can be addressed to be a balanced document. This is one of the main reasons that it enjoys broad acceptance.

How to conclude on BAT?

It has to be noted that the Technical Working Group (TWG) played the key role in the identification and determination of BAT. There is no scientific methodology available and applicable so far to determine BAT. Rather expert judgement within the TWG was most important. This approach inevitably includes compromises but at the same time the degree of balance and acceptance is optimised. In case of the iron and steel industry and emissions to air a sufficient measured number of emission values were available. So an approach could be to go, for instance, for the best of the best or for the 10% best performing plants. Another one is to cut off the 30% worst performing plants when considering a frequency distribution. The setting of such criteria is a fundamental approach. When determining BAT the TWG did not decide to follow such an approach. Thus BAT in one case may represent the 10% best performing plants and in another one the 70%, or other percentages. The overall consideration of BAT conclusions in the I&S-BREF leads to the statement that a high or very high level of environmental protection has been selected.

The following five examples have been chosen in order to explain the process of BAT selection/development.

BAT for residual dust and PCDD/F content in off gases from sinter plants

The fact is commonly accepted that sinter plants respectively sinter strands dominate the emissions to air from integrated steelworks (see figure 2). For these plants low achievable emission levels both for dust and PCDD/F have been concluded as follows:

„Waste gas de-dusting by application of:

- Advanced electrostatic precipitation (ESP) (moving electrode ESP, ESP pulse system, high voltage operation of ESP ...) *or*
- electrostatic precipitation plus fabric filter *or*
- pre-dedusting (e.g. ESP or cyclones) plus high pressure wet scrubbing system.

Using these techniques dust emission concentrations < 50 mg/Nm³ are achieved in normal operation. In case of application of a fabric filter, emissions of 10-20 mg/Nm³ are achieved."

„Minimising of PCDD/F emissions, by means of:

- Application of waste gas recirculation;
- Treatment of waste gas from sinter strand;
- use of fine wet scrubbing systems, values < 0.4 ng I-TEQ/Nm³ have been achieved.

Fabric filtration with addition of lignite coke powder also achieves low PCDD/F emissions (> 98 % reduction, 0.1 – 0.5 ng I-TEQ/Nm³. – this range is based on a 6 hours random sample and steady state conditions)."

About 10% best performing plants already meet these values.

The mentioned values for dust seem to be relatively high compared to other sources of particles, e.g. for electric arc furnaces (see 5.3.1). But the properties of dust from sinter plants is very specific and removal efficiency is significant different from dust of other sources, especially in case of application of electrostatic precipitators.

BAT for coke oven plants

Maintenance programme

The smooth and undisturbed operation of coke oven plants can only be secured by application of specific maintenance programmes. The quality of such programmes can not be specified or qualified by numbers. Nevertheless the introduction and performance of such programmes is of the most important process-integrated measure for coke oven plants. The maintenance

programme is described in detail as a technique to consider in the determination of BAT meanwhile the conclusion is:

> „Extensive maintenance of oven chambers, oven doors and frame seals, ascension pipes, charging holes and other equipment (systematic programme carried out by specially trained maintenance personnel)“

This example demonstrates that BAT can not be always defined along with associated emission concentrations or factors.

Coke dry quenching (CDQ)

Regarding coke dry quenching (CDQ) it has to be noted that world-wide CDQ plants are in operation at about 60 coke oven plants in 18 different countries. Most of them are located in the CIS countries (Commonwealth of Independent States) because of climate conditions (25 plants with 109 units) and in Japan (20 plants with about 33 units) because of high energy prices. In Japan CDQ is installed at 80% of plants. Nevertheless CDQ has not been unrestrictedly concluded to be BAT because of cost-environmental benefit aspects.

Example:

The investment cost for a 2 Mt/a plant is

- about 5 Mio Euro for a wet quenching facility
- about 100 Mio Euro for dry quenching; note: normally coke oven plants with CDQ also have to have a wet quenching facility because of low availability of CDQ units

The main advantages of dry quenching are:

- energy recovery (in Europe only covering operation cost, that means there is no pay back),
- no plumes,
- reduced dust emission (5-10 g/t instead of 10-25 g/t for wet quenching with emission optimised tower),
- lower emissions of H_2S and NH_3 but this reduction is not of high environmental relevance.

However CDQ is mentioned in the BAT conclusions but along with certain conditions for application:

> „Coke dry quenching (CDQ) with recovery of sensible heat and removal of dust from charging, handling and sieving operations by means of fabric filtration. With respect to present energy prices in the EU, „instrument/operational cost-environmental benefit“- consideration sets strong limitations on the applicability of CDQ. In addition a use of recovered energy must be available.“

BAT for electric steelmaking

BAT for residual dust content

Following conclusion has been drawn in the I&S-BREF:

> „Well-designed fabric filter achieving less than 5 mg dust/Nm³ for new plants and less than 15 mg dust/Nm³ for existing plants, both determined as daily mean values."

The residual concentration dust concentration of 15 mg/Nm³ for existing installations certainly does not represent the 10 to 20 % best performing plants. Data from 1994, reported for 45 installations in Europe indicate that more than two third of the installations achieved this concentration already at that time [EC Study, 1996]. This statement can not put into perspective due to the fact that the qualification of these data is incomplete. Rather this value represents a compromise made by the TWG. Economic aspects have been the driving force for this conclusion.

BAT for residual PCDD/F content

In this case the TWG concluded BAT as follows:

> „Minimising of organochlorine compounds, especially PCDD/F and PCB emissions, by means of:
>
> ?? appropriate post-combustion within the off gas duct system or in a separate post-combustion chamber with subsequent rapid quenching in order to avoid de novo synthesis *and/or*
>
> ?? injection of lignite powder into the duct before fabric filters.
>
> Emission concentrations of PCDD/F 0.1 - 0.5 ng I-TEQ/Nm³ are achievable."

This conclusion characterises the techniques already installed at a few plants only in Europe. Thus it represents the best performing plants; in this case less than 10% of the existing plants.

CONCLUSION

The I&S-BREF is a document submitting reasonable, credible and technically good information on the best available techniques which can be a challenge to implement but always applicable in practice. It is broadly considered as a well-balanced document. No split views had to be reported. The BAT levels reflect a high level of environmental protection and is fully in line with aims and demands of the IPPC-Directive.

Conclusions on BAT can also include descriptions of production-integrated measures without defining associated achievable values.

Residual dust contents may be different for different sources depending on physical-chemical properties of dusts.

REFERENCES

EC, European Commission, Joint Research Centre, IPTS, European IPPC Bureau, Harald Schoenberger, (2000): *Final draft Best Available Techniques Reference Document on the Production of Iron and Steel.*

The BREF on the Production of Iron and Steel has been posted in pdf format on the web site of the European IPPC Bureau (EIPPCB) http://eippcb.jrc.es /Activities– Iron and Steel Industry - Documents) and can be downloaded. The pdf- format is readable if one has the Adope Acrobat reader software.

EC Study, European Commission, Roederer, C.; Gourtsoyannis, L., (1996): *Coordinated Study 'Steel-Environment'*. DG XII - EUR 16955 EN

5.2 The BREF in the pulp and paper industry

BAT for an industry with a large variety of raw materials and products

Michael Suhr,
Federal Environmental Agency,Germany
(Formerly European IPPC Bureau)

Introduction

The final draft BREF on Pulp and paper Industry has been available since February 2000. The document was generally endorsed by Member States and Industry at the IEF Meeting on 28/29 February 2000. Within the next weeks the consultation for the endorsement procedure will be completed so that an adopted version can be expected soon.

The reference document cannot be discussed here in detail because of its pure size and complexity. It comprises nearly 500 pages and contains detailed information on most environmental aspects of the sector. This presentation briefly highlights some characteristics of the sector, explains how the document presents best available techniques (BAT) for this complex industry with different raw materials and a wide variety of products, and discusses examples for the determination of BAT concerning emissions to water. It summarizes briefly major points of debate and how they were resolved in the Technical Working Group (TWG).

Some characteristics of the sector

The European Pulp and paper Industry is characterised by a large variety of raw materials, products and manufacturing routes. It was therefore one of the tasks of the TWG to find an appropriate approach to this industry that takes into account the complexity of the sector and the differences between pulp and paper mills.

Variety of products

In developed societies the use of a multitude of paper and board products is everyday reality for most people. A look at the main functional uses of paper and board shows the diversity of products. Paper is used for collection, distribution and storing of information, for packaging of goods, for hygienic purposes (personal care, cleanliness, disease prevention) and a large variety of special applications. In order to meet the customers needs the paper industry manufactures different products such as newsprint, printing and writing papers, magazine paper, packaging paper, boxes, tissue (toilet paper, kitchen towels, napkins, etc.) and a large number of special papers (e.g. stamps, air filters, coffee filters, baking paper etc.). Each of these categories demands specific properties of the product and the most appropriate manufacturing route to these products may differ substantially.

Variety of raw materials and processes

Paper is essentially a sheet of cellulose fibres with a number of added constituents to affect the quality of the sheet and its fitness for intended end use. Besides fibres and chemicals, manufacturing of pulp and paper requires a large amount of process water and energy in the form of steam and electric power.

The *pulp* for paper making may be produced from virgin fibre (wood) by chemical or mechanical means or may be produced by the re-pulping of recovered paper. In the pulping process the raw cellulose-bearing material is broken down into its individual fibres. In Europe, wood is the main raw material for virgin pulp production. In *chemical pulping*, chemicals are used to dissolve the lignin and free the fibres. The lignin, and many other organic substances, are thus put into solution from which the chemicals and the energy content of the lignin and other organics may be recovered. In mechanical pulping processes mechanical shear forces are used to pull the fibres apart and the majority of the lignin remains with the fibres although there is still dissolution of some organics. Pulps produced in different ways have different properties which make them suited to particular products.

Recovered paper has become an indispensable raw material for the paper manufacturing industry. Paper produced by the use of recovered paper as fibre source will involve some cleaning of contaminants prior to use and may involve de-inking depending upon the quality of material recycled and the requirements for the properties of the end product. Many different *recovered paper processing* systems are applied in European paper mills.

Paper may also comprise up to 45% of its weight in fillers, coatings and other substances.

Both the variety of raw materials used and the various end products result in a lot of different options for the manufacturing routes. However, the different raw materials used and processes involved can be broken down in a number of unit operations („building blocks„) that are similar in all mills (see section 3.1).

Variety of size of paper mills

According to item 6.1 of Annex I of the IPPC Directive industrial plants for the production of pulp from timber or other fibrous materials and paper and board with a production capacity exceeding 20 tonnes per day are supposed to be dealt with in the BREF. This definition of the scope includes all pulp mills and according to the Confederation of European Paper Industries (CEPI) 98% of the European paper mills. Consequently, the BREF addresses the whole industry and not only the biggest companies. This includes small paper mills e.g. in France, Germany, Italy, Portugal, Spain or U.K. producing around 10000 tonnes of paper per year. On the other side of the spectrum there are big paper mills that manufacture more than 250000 t/a.

BAT for pulp and paper mills

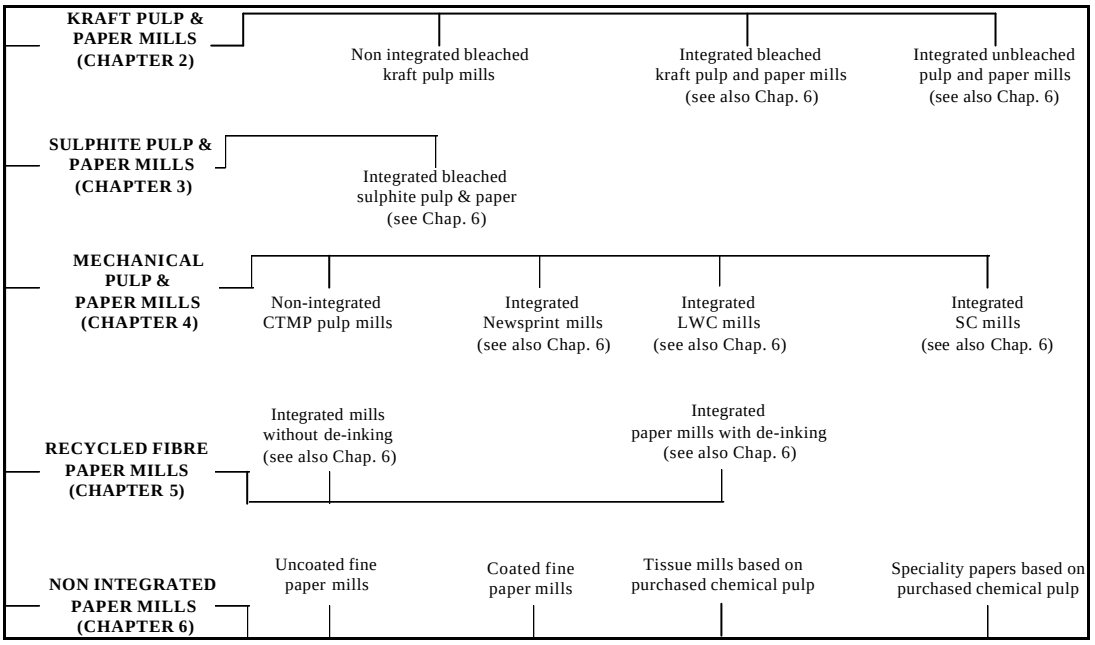
General structure of the BREF for the pulp and paper industry

At the beginning of the work on the BREF, a generally agreed structure of the sector had to be developed that separates the sector into different classes of mills from an environmental perspective. This was not an easy task because of the variety of raw materials and products already mentioned above. However,

it was indispensable because the use of different furnishes, the application of specific manufacturing routes and the manufacturing of specific product qualities result in different emissions and consequently different options for pollution prevention and control have to be considered.

Bearing in mind that there is no single right or wrong proposal and that there is no classification that covers all real cases a compromise was essential. The preferred proposal focuses on the common ground and then questions what separates the different groups. It is considered to be simple and manageable and gives preference to classifying the European Paper Industry according to major sources of pollution and possible techniques for pollution prevention and control. The proposed structure of the European pulp and paper industry as used in the BREF is shown in figure 1.

Figure 1: Classification of pulp and paper mills proposed by the BREF and structure of the document [1]



The BREF describes the most important pulp, paper and board manufacturing processes separately for five main classes. The main types of pulp and paper manufacturing are sub-divided in several sub-classes, where appropriate. From what has been said above - there is no classification that perfectly covers all real cases - it is obvious that the structure has to be fine-tuned to the structure of Paper Industry within the single Member States so that it fits to the specific characteristics and situation of the given industry.

Presentation of BAT

Manufacturing of pulp and paper is not a single process but a series of unit processes, often linked and interdependent. Consequently, several BATs for different mill classes are necessary to address all products and processes involved in the European pulp and paper industry. For describing best available techniques for this sector the following aspects should be kept in mind:

- There is no single reference of best available techniques in pulp and paper industry. The list of best available techniques consists of many process-integrated and some external measures for prevention and control of pollution that constitute the overall BAT for pulp and paper mills. These components may be combined in different ways. BAT is therefore always a suitable combination of techniques. Following the integrated approach it is evident that BAT levels can be achieved in different ways, i.e. there are several options to achieve similar emission and consumption levels. When it comes to BAT associated emission levels, it is important to note that between mills the degree of application of techniques varies and consequently so do the associated emission levels.
- The BAT-concept includes a process-related element because the environmental impact may vary when processes with different pollution potential are applied (e.g. recovered paper processing to produce cartonboard can be carried out with or without de-inking). Besides product-related aspects (see next bullet), the applied processes determine the unabated emission of a mill. That means when approaching the pulp and paper industry different types of processes involved have to be taken into account.
- On the other hand, for the pulp and paper industry the best available techniques cannot be defined solely by describing unit processes. Instead, the whole installations must be examined and dealt with as entities. In this connection, the raw materials used and the product properties to be achieved are important influences to be taken into account. As a consequence, the process-oriented approach has to be extended by a product-oriented concept i.e. the BAT approach must be linked to the environmental performance of specific types of mills where specific products are manufactured. Thus, in this document best available techniques are presented for major mill classes separately (see section 3.1).
- Instead of single distinctive values the environmental performance of paper mills is expressed as a range of values reflecting that the manufacturing of different paper grades requires different quantities and qualities of raw materials (e.g. softwood/hardwood, different qualities of waste paper, mixture of furnishes etc.), with the consequence that emissions per end product may vary within a certain range. To a certain extent, higher emissions caused by the use of more polluting raw materials or processes respectively can be compensated by higher efforts for pollution prevention and control. Presenting ranges considers also that emissions vary with time to a certain extent, e.g. between years, even if the same techniques have been used.

Examples for the determination of BAT concerning emissions to water

The concept of IPPC - and thus of the BREF - covers several issues such as minimisation of resource and energy consumption, controlling emissions into air, water and soil, taking into account cross media effects and economics issues.

Special emphasis is given to the IPPC principle of eliminating pollution by intervention at source by process integrated BAT measures. However, in order to achieve the general target of the Directive - a high level of protection for the environment as a whole - process integrated measures and end-of pipe techniques together constitute the overall BAT for pulp and paper mills.

Historically, pulp and paper mills were, and mostly still are located close to some body of water as the availability of water plays a major role in the production process. Rivers were used to generate the power needed for the pulping, to supply process water and as recipient for discharges from the mills. However, in the European paper Industry the discharges to water have been substantially reduced by means of a number of process integrated and external measures. There is a development to further closing up the water circuits in pulp and paper mills so that a further reduction of discharges can be expected in the future (towards effluent free mills). But to date, water is still one of the major raw materials in pulp and paper manufacturing. Pulp and paper mills are often a significant contributor of pollutant discharges to the environment.

So, some simplified examples with regard to water consumption and related discharges are chosen in order to explain how BAT is addressed in the BREF for this sector. It will be shown how the manufacturing of different raw materials and the production of different end products have an effect on the emission to water and how these aspects have been taken into account when deriving emissions levels that are associated with the use of BAT. The first example refers to the kraft pulp processing that uses wood as major raw material. The second example refers to recovered paper processing mills that use recycled material as fibre source. Because of limited space the description focuses on emissions to water and within this subject on the sum of discharged organic substances usually measured as chemical oxygen demand (COD). More details can be found in the BREF itself.

Example 1: Emissions to water from bleached kraft pulp mills

Kraft pulp mills are characterised by the fact that they have concentrated their environmental efforts on process-integrated measures. This trend is reflected in the BREF. BAT for bleached kraft pulp production is in the first place a combination of 11 internal measures shown in the two boxes below:

- Dry debarking of wood
- Modified cooking
- Closed cycle brown stock screening
- Highly efficient brown stock washing
- ECF or TCF final bleaching
- Some, mainly alkaline, process water recycling from the bleach plant
- Purification and re-use of the condensates

- Effective spill monitoring, containment, and recovery system
- Sufficient black liquor evaporation plant and recovery boiler to cope with the additional liquor and dry solids loads due to collection of spills, bleach plant effluents etc.
- Collection and re-use of clean cooling water
- Primary treatment of waste water

The efficiency of each of these measures varies considerably with the design and operation practices at different mills. To be regarded as BAT, a measure must also be well designed and operated. Depending on the type of pulp wood used, the specific process-integrated measures implemented and the technical characteristics of the mill, specific emission levels to water are associated with the use of a combination of BAT. In order to ensure transparency, the BREF gives BAT ranges before and after biological treatment. In doing so, the reader is in a position to easier follow how the BAT conclusions flow from the selected techniques and the assumptions made. The BREF therefore presents both the environmental performance of process integrated measures only, as well as the combination with external treatment.

In our example of bleached kraft pulp mills, the BAT range *before* biological treatment is:

- 30 - 45 kg COD per tonne of pulp produced

Biological waste water treatment is further regarded as BAT. A reduction efficiency of biological treatment of > 55 % for COD is considered BAT (up to 65-75% are achieved in well designed and controlled low loaded activated sludge plants with long retention times).

That gives a calculated BAT range *after* biological treatment of:

- 13.5 - 21 kg COD per tonne of pulp (or 8 - 12 with best achievements).

The BREF finally gives a BAT range of 8 - 23 kg COD per tonne of pulp. This emission level is achieved when a combination of together 12 measures is applied.

For better understanding of the BAT emission ranges some additional background information might be useful:

The BAT emission ranges in the BREF are always based on a number of real world examples that have achieved this level. In our example, there are 3 bleached kraft pulp mills that achieve around 8 kg COD per tonne of pulp (Canada, Finland, Sweden). These mills are the very best performers and

confirm the lower end of the range. Normally, for recently build mills or for those mills, which have increased substantially their production capacity it is somewhat easier to perform at the lower end of the BAT range presented in the BREF. On the other hand, the ranges are set wide enough to be applicable to most existing mills. This is confirmed by a larger number of other real world examples that fall within the whole BAT range. The upper end of the range considers also different starting points of mills and includes a balancing of cross media effects and cost aspects on a sector level. Those mills not achieving within the range associated with this general BAT could normally improve their performance towards the range. Under a European perspective - and also compared to the competitors in North America and Asia - the whole BAT emission range for kraft pulp mills stands for well performing mills. The very best performers could be expected to lie within the better part of the range whereas other mills achieving within the range may have implemented a set of BAT measures but not necessarily all and not necessarily to their full extent. The influence of different raw materials (softwood/ hardwood) and different product qualities (market pulp, pulp for integrated paper production) is also taken into account when proposing these ranges.

For some users of the BREF the range of emissions associated with BAT might seem to be quite wide. This is reflecting that for technical and economic reasons the majority of the TWG did not support more narrow ranges, which are closer to the very best achievements. The given BAT emission ranges are a result of balancing all the different views and technical and economic arguments exchanged in the TWG. They are not representing the best of the best. Nevertheless, they are reflecting a high level of protection of the environment as a whole.

Example 2: Emissions to water from recovered paper processing paper mills (RCF) without de-inking

Recovered paper processing systems vary mainly according to the paper grade to be produced e.g. packaging paper, newsprint, testliner, or tissue paper. Generally, recovered paper processes can be divided in two main categories:

- processes with exclusively mechanical cleaning i.e. *without de-inking*. They comprise products like case making materials, board and cartonboard;
- processes with mechanical and chemical unit processes i.e. *with de-inking*. They comprise products like newsprint, printing and copy paper, tissue, magazine papers (SC/LWC), some grades of cartonboard or market DIP.

The following example refers to the first group of mills, i.e. RCF paper mills without de-inking.

Again, BAT is a combination of internal measures and biological treatment. The following box gives an overview about BAT for reducing emissions to water:

- Separation of less contaminated water from contaminated one and recycling of process water;
- Optimal water management (water loop arrangement; water clarification by sedimentation, flotation or filtration techniques and recycling of process water for different purposes;
- Strict separation of water loops and counter-currents flow of process water;
- Installation of an equalisation basin and primary treatment;
- Biological effluent treatment;
- Partial recycling of treated water after biological treatment;
- Treating internal water circuits

It has to be noted that European RCF paper mills use different qualities of waste paper for the production of comparable products. Depending on the type of waste paper used and the specific process-integrated measures implemented, a pollution load before biological treatment of 20 - 40 kg COD per tonne of paper can be expected for RCF paper mills without de-inking. A waste water flow < 7 m³ per tonne of paper is considered BAT.

Concerning water consumption the TWG discussed whether or not the reduction of water use is an environmental benefit to be considered at sector level or whether it is only a concern for those areas where water is scarce. For pulp and paper mills it could be shown that the reduction of discharges is strongly related to the recovery and recycling of process water resulting in a reduction of fresh water consumption. Increased closure of water circuits in paper mills will result in less volume and more concentrated waste water, which in general can be treated more efficiently. Decrease of process water flows will also increase the applicability of internal measures and advanced technologies. Therefore, reduction of the intake of fresh water mostly leads to decreasing discharges to surface waters.

As already mentioned, biological waste water treatment is one of the BATs. Combined anaerobic-aerobic biological treatment is the preferable option for non-de-inked grades. This is because these mills usually have realised a high degree of water circuit closure resulting in very concentrated waste water that is favourable for anaerobic treatment. A reduction efficiency of > 95 - 97% for COD is considered BAT. That gives a calculated remaining COD load after biological treatment of 1 - 2 (with 95% reduction) and 0.6 - 1.2 kg/t (with 97% reduction). The BREF gives a BAT range of 0.5 - 1.5 kg COD per tonne of paper. This range reflects the different influences on the overall environmental performance of RCF paper mills (different raw materials i.e. waste paper of less or better quality; different products manufactured in different product lines at one mill such as e.g. testliner, wellenstoff, white topliner etc.)

RCF paper mills that produce paper from better quality waste paper i.e. that are faced with lower initial COD loads and that manufacture mostly bulk grades with less changes of paper grades can normally achieve the lower end

of the range. Other mills with more changes of grades, higher product qualities and worse waste paper quality (i.e. higher initial COD loads) might rather achieve the upper end of the range.

Again, the range is derived iteratively from a number of real world examples. There are a few mills that achieve 0.5 kg COD/t or even operate with zero liquid effluents. Concerning closed water systems however, the TWG Members did not support the option to consider this technique as BAT on a sector level because the few existing mills that have implemented closed water loops with in-line biological treatment of process water still have some operational problems to resolve. For instance, the uncontrolled precipitation of calcium carbonate in closed circuits applications is still waiting for a satisfactory technical solution. Although not yet generally applicable, closed water loops might be considered as a feasible option in specific cases. On the other hand, many RCF paper mills that have implemented the above mentioned BATs fall within the whole BAT range. As it stands now in the BREF, the emission levels that are associated with the use of BAT can be achieved by most mills independently from the quality of the waste paper used.

How major points of debate were resolved

The Best Available Techniques Reference Document in Pulp and paper Industry has met great support from the TWG and IEF. Generally, a high degree of consensus has been reached within the TWG. Nevertheless, in the course of the information exchange on BAT there were some points of debate that were discussed contentiously. The two major points of debate are briefly summarised below.

New and existing mills

A few Member States and CEPI expressed their view that the BAT associated emission levels should be presented separately for new and existing mills. What seems to be logical on the first view is more problematic from a practical point of view. Difficulties are caused by the fact that in pulp and paper mills, the applicability of a technique is not only driven by the fact whether a mill is new or existing. Pulp and paper mills are characterised by the trend that machinery is rebuilt over years rather than replaced whole-scale (modular rebuilding and development of plants). Thus, due to progressive rebuilding, updating, process control and environmental management systems, there are many existing mills with comparable or even better environmental performance (at least for some parameters) than recently built mills. Furthermore, BAT statements for new mills are to a certain extent speculation. Consequently, all descriptions and data of this document are based on existing mills.

Smaller and bigger mills

Another point of disagreement is that a few Member States and CEPI wished to have different BATs and BAT associated emission levels for smaller and bigger mills. The difficulty in the Technical Working Group was that the experts provided no information on which techniques are in-applicable to smaller mills from a technical and economic point-of-view. Well-founded information on appropriate BAT levels for smaller mills have not been provided either and it is thus unclear which yardstick to use for this purpose. For some parameters the achievable environmental performance of smaller and bigger mills may vary within a certain range. On the other hand, there are also some smaller mills that achieve good environmental performance. Generally, the relevant techniques that are currently available for prevention or reduction of emissions and consumption are the same independent of the size of the mills. The impact, if any, of the size of the mill will be taken into account by the permitting authority in the Member State in question when determining BAT in the specific case. Therefore, no distinction of BAT between smaller and bigger mills should and has been made in the BREF. Generally, it can be stated that the specific costs for smaller mills are relatively higher (economies of scale), smaller mills might have less financial possibilities for technical changes, and it might happen that material or lay-out of older equipment does not suit to a higher degree of water closure. Smaller mills might sometimes not have the knowledge available which would be necessary to run and control more complex process solutions most efficiently.

Conclusions

The BREF for the Pulp and Paper Industry represents the information exchange on BAT that has taken place over the last three years. Special emphasis is given to the measures for prevention and controlling pollution by intervention at source by process integrated BAT measures. However, in order to achieve the general target of the Directive - a high level of protection for the environment as a whole - process integrated measures and end-of pipe techniques together constitute the overall BAT for pulp and paper mills.

The EIPPCB has assessed all information (whether provided by the TWG or collected itself) and has considered thoroughly all points of view from TWG Members. The document reflects, at a sector level, the variety of raw materials, products and processes in the European Paper Industry. The BREF is the product of a considerable breadth of expertise. It contains relevant information for decision-makers. The document meets broad support of the TWG. However, there are still a few points of disagreement. These points of debate are discussed within the Conclusion and Recommendation Chapter of the BREF.

References

[1] European Commission, Joint Research Centre, IPTS, European IPPC Bureau, Michael Suhr 2000. Draft Reference Document on Best Available Techniques in the Pulp and Paper Industry, Draft dated February 2000. The BREF Pulp and Paper Industry has been posted in pdf format on the web site of the European IPPC Bureau (EIPPCB) http://eippcb.jrc.es (Activities - Pulp and Paper Industry - Documents) and can be downloaded. The pdf format is readable if one has the Adobe Acrobat reader software.

5.3 BAT process selection and split views

illustrated by examples from the
Cement and Lime and Chlor-Alkali BREFs

Petra Hagström,
European IPPC Bureau

BAT process selection

The Best Available Techniques Reference (BREF) documents are meant to be tools to drive environmental performance. Bearing this in mind the BREFs select BAT processes for the sectors when it is appropriate, instead of presenting BAT performance levels associated with each existing process technology. To change process technology is in many cases a very costly operation and not something you do every year or even every decade.

Within the Technical Working Groups (TWGs) this issue has been discussed at length. A commonly expressed view is:

- „We have to differ between new and existing plants, it is not possible for all existing installations to change process/implement BAT before 2007."
- (2007 is when the IPPC Directive must be applied to existing plants)

Therefore, before I go to the examples of BAT process selection in the Cement and Lime and the Chlor-Alkali BREFs, I would like to take the opportunity to repeat some basic points, that have been repeated many times during the BREF work but, nevertheless, are worth repeating again.

- Implementing the IPPC Directive does not mean that every existing plant has to implement BAT before 2007.

To implement the IPPC Directive simply means that all installations should have a permit issued in accordance with the IPPC Directive by 2007.

- The BREF provides a general BAT on the sector level.

Which means that the presented BAT is considered to be appropriate for the sector as a whole, but not necessarily appropriate, nor even technically possible for immediate implementation at all individual sites.

- The IPPC Directive does not set a time limit for when BAT should be implemented at the individual plant.

Some BATs are easy to implement in the short term perspective, others, such as change of process, have to be considered in the long term investment planning. It is considered that existing installations could be expected, over time, to move towards the general BAT levels.

BAT process selection – Cement manufacturing

In the manufacture of cement there are alternative technologies for converting the raw materials into product cement clinker. The selected process has a major impact on the energy use and air emissions. The BAT conclusion regarding process technology is:

- For new plants and major upgrades the best available technique for the production of cement clinker is considered to be a dry process kiln with multi-stage preheating and precalcination. The associated BAT heat balance value is 3000 MJ/tonne clinker.

The clinker burning is the most important part of the cement manufacture process in terms of the key environmental issues; energy use and emissions of nitrogen oxides (NO_x), sulphur dioxide (SO_2) and dust to air. The clinker burning takes place in a rotary kiln which can be part of a wet or dry long kiln system, a semi-wet or semi-dry grate preheater (Lepol) kiln system, a dry suspension preheater kiln system or a preheater/precalciner kiln system. Figure 1 and Figure 2 shows schematic views of the cement production process and of a preheater kiln with precalciner.

Figure 1: The Cement Production Process

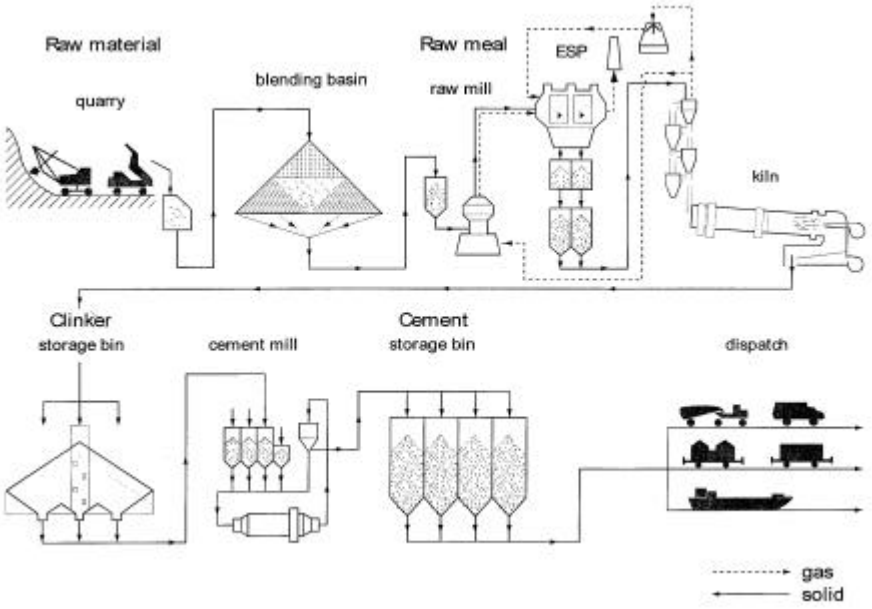
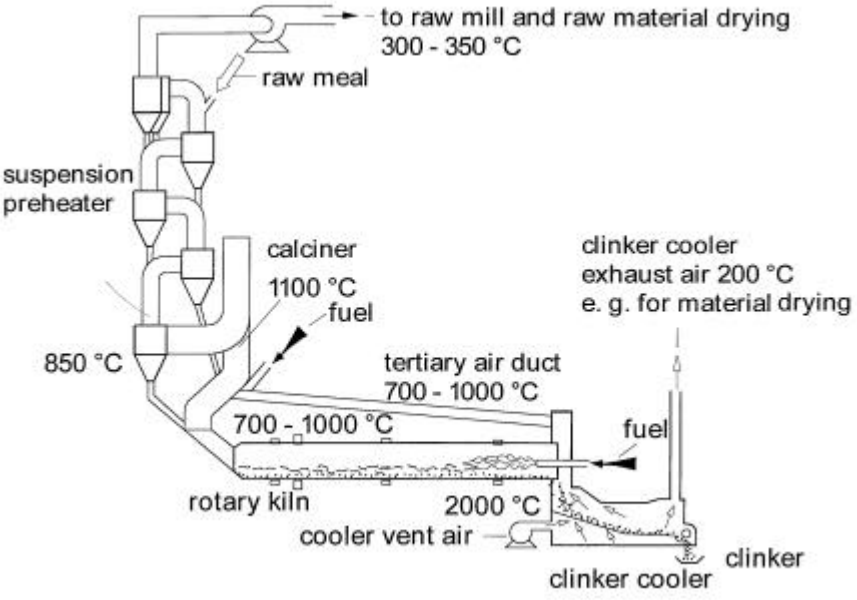


Figure 2: Preheater kiln with precalciner



The first rotary kilns were long wet kilns where the whole heat consuming thermal process takes place in the kiln itself. Grate preheater technology, perhaps better known as the Lepol kiln, represented the first approach to letting part of the clinkering process take place in a stationary installation outside the kiln. This allowed the rotary kiln to become shorter and so reduced the heat losses and increased energy efficiency. The development towards more and more energy efficient kiln systems then continued with the suspension preheater technology, multi-stage cyclone preheaters and precalciners. With the precalcination technique the heat input is divided between two points. Up to 60% of the total fuel can be burnt in a special combustion chamber between the rotary kiln and the preheater, the raw meal is almost completely calcined when it enters the kiln and only the clinker forming stage takes place in the high temperature zone of the rotary kiln.

The theoretical energy use for the burning process (chemical reactions) is about 1700 to 1800 MJ/tonne clinker. The actual fuel energy use for different kiln systems is in the following ranges (MJ/tonne clinker):

- about 3000 for dry process, multi-stage cyclone preheater and precalciner kilns,
- 3100 – 4200 for dry process kilns equipped with cyclone preheaters, and
- 3300 – 4500 for semi-dry/semi-wet processes (Lepol-kilns),
- up to 5000 for dry process long kilns,
- 5000 – 6000 for wet process long kilns.

At present, about 78% of Europe's cement production is from dry process kilns, a further 16% of production is accounted for by semi-dry and semi-wet process kilns, with the remainder of European production, about 6%, coming from wet process kilns. The wet process kilns operating in Europe are generally expected to be converted to dry process kiln systems when renewed, as are semi-dry and semi-wet processes kiln systems. Plants using wet or semi-wet processes normally only have access to moist raw materials but the industry has moved towards the dry process preferentially even for these cases.

The shorter kilns and the precalciner technique enables less fuel to be burnt in the hot zone of the kiln which also results in lower emissions of nitrogen oxides (NO_x). The suspension preheater technology also facilitates the installation of Selective non-catalytic reduction (SNCR) for the further reduction of NO_x emissions.

In the cement sector it has thus been a development over time towards more energy efficient kiln systems with lower emissions to air, where the latest development is considered to be BAT.

BAT process selection – Chlor-Alkali manufacturing

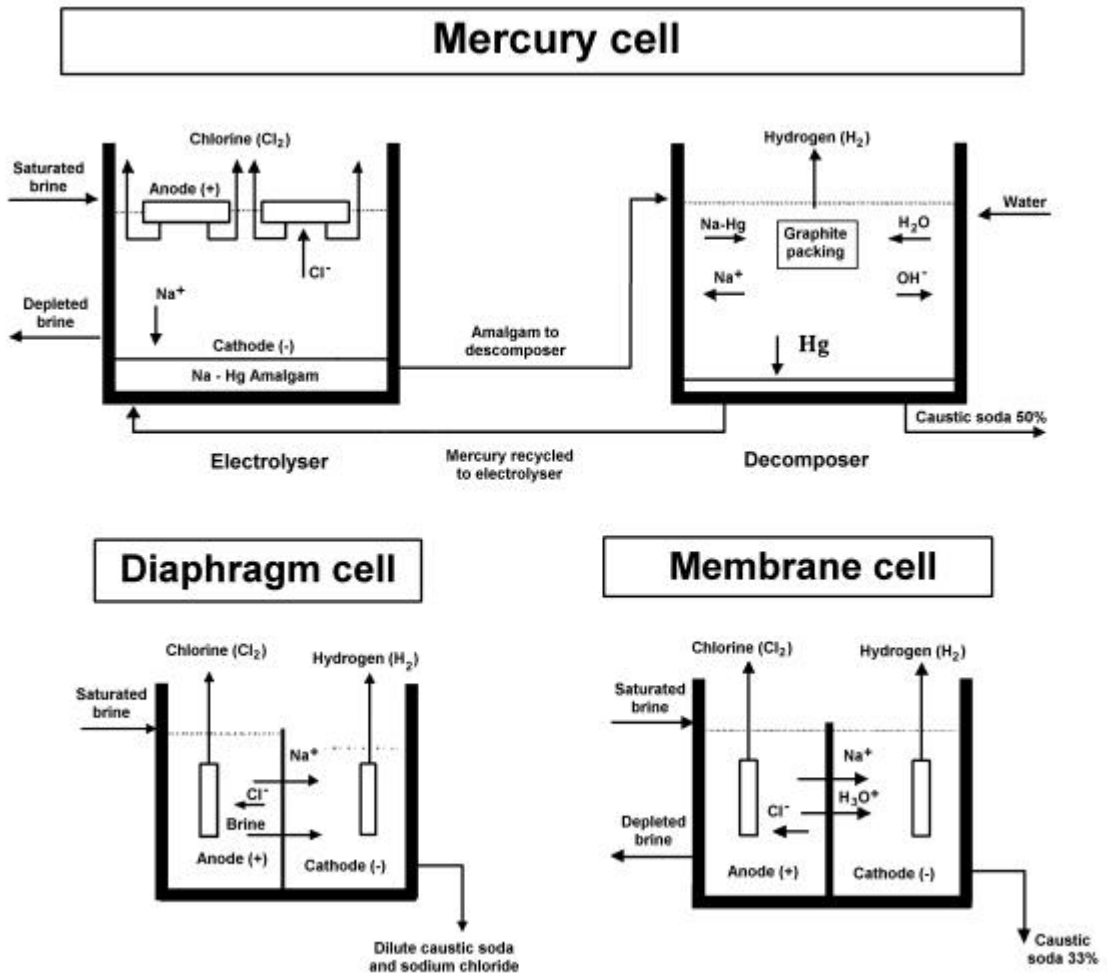
Again, in the case of the chlor-alkali process there are true alternative technologies for the electrolysis of salt solution to produce sodium (or

potassium) hydroxide and chlorine. The selected process technology has a major impact on the energy use and emissions from the manufacture of chlor-alkali. The draft BAT conclusion regarding process technology is:

?? Best available techniques for the production of chlor-alkali is considered to be membrane technology. Non-asbestos diaphragm technology can also be considered as BAT when there is a need for weak caustic. The total energy use associated with BAT for producing chlorine gas and 50% caustic soda is less than 3000 kWh (AC) per tonne of chlorine, liquefaction excluded.

There are three basic process technologies for the electrolytic production of chlorine and caustic solution (NaOH or KOH). These three processes are the diaphragm cell process, the mercury cell process, and the membrane cell process. Each process represents a different method of keeping the chlorine produced at the anode separate from the caustic soda and hydrogen produced, directly or indirectly, at the cathode. Figure 3 shows a simplified scheme of chlorine electrolysis cells.

Figure 3: Simplyfied scheme of chlorine elektrolysis cells



The diaphragm and mercury cell technologies were both developed in the late 1800s whereas the membrane cell technology was first used in industrial production in the 1970s.

The diaphragm in the diaphragm cell process is usually made of asbestos. The cathode in the mercury cell process is liquid mercury. Both asbestos and mercury are substances that have been declared unwanted in the technosphere by society at large. They are both high priorities on a number of environmental and health hazard action lists world wide.

Diaphragm cells produce a 12% caustic solution with impurity levels that make it unsuitable for some applications. Mercury cells produce 50% caustic solution with low salt levels but contaminated with mercury.

Membrane cell technology does not have the disadvantage of using hazardous substances in the production process and it produces 33% caustic solution with low salt levels (<50 ppm NaCl). Membrane cells require higher brine purity than diaphragm and mercury cells as impurities affect the membrane performance.

The membrane cell process is more energy efficient than diaphragm and mercury cell processes, also when steam requirements for concentration of caustic (if higher concentration than 33% is required) and brine purification are included.

Membrane cell technology thus produces high quality caustic, pollutes less and uses less energy than diaphragm or mercury cell processes. All things considered, the conclusion that membrane cell technology is BAT in the chlor-alkali sector can not come as a surprise to anyone.

Split views

In the cement and lime BREF work the TWG had to agree to disagree about the BAT emission level for NO_x from cement kilns. Although everyone agreed that the technical information on NO_x abatement techniques is correct, the evaluation of the information differed and, despite long discussions, we had a split view.

BAT conclusion regarding NO_x abatement for cement kilns

Best available techniques for reducing NO_x emissions are primary measures combined with staged combustion or selective non-catalytic reduction (SNCR). Therefore, based on the combination of these techniques and the performance of each component of the combination, the emission level associated with the use of BAT is 200-500 mg NO_x/m^3 (as NO_2, expressed on a daily average basis and standard conditions of 273 K, 101.3 kPa, 10% oxygen and dry gas).

Whilst there was support for the above concluded BAT to control NO_x emissions, there was an opposing view within the TWG that the BAT emission level

associated with the use of these techniques is 500-800 mg NO_x/m^3 (as NO_2). There was also a view that selective catalytic reduction (SCR) is BAT with an associated emission level of 100-200 mg NO_x/m^3 (as NO_2).

Techniques for controlling NOx emissions

The current reported NO_x emission range in the cement industry is from less than 200 up to 3000 mg NO_x/m^3. Techniques for controlling NO_x emissions that are discussed in the BREF are primary measures, staged combustion, selective non-catalytic reduction (SNCR), and selective catalytic reduction (SCR).

Primary measures and staged combustion

Some modern well-optimised suspension preheater kiln systems and suspension preheater/precalciner kiln systems are achieving NO_x emission levels of less than 500 mg/m³ with either primary measures only or combined with staged combustion. Raw material quality and kiln system design may be reasons for not achieving this emission level. On a sector level the majority of kilns in the European Union is said to be able to achieve less than 1200 mg/m³ with primary measures.

Selective non-catalytic reduction (SNCR)

With SNCR the achieved NO_x emission levels in the best cases are less than 200 mg/m³ with initial levels between 750-1350 mg/m³ (80-85% reduction) without significant NH_3 slip, although the majority of SNCR installations are today operated to achieve an emission level of 500-800 mg/m³ (10-50% reduction).

The TWG experts agree that a reduction with SNCR of 60-65% is achievable without significant NH_3 slippage problems. On a sector level the majority of kilns in the European Union is said to be able to achieve less than 1200 mg/m³ with primary measures. By applying SNCR at moderate reduction efficiencies of about 60% this could reduce the NO_x emission level to less than 500 mg/m³.

To fit SNCR, an appropriate temperature window has to be accessible. The right temperature window is easy to obtain in suspension preheater kiln systems, in suspension preheater/precalciner kiln systems and possibly in some Lepol kiln systems. At the moment no full scale installation of SNCR in Lepol kilns exists, but promising results from pilot plants have been reported. In long wet and dry process kilns it might be very difficult, or impossible, to obtain the right temperature and retention time needed. At present, about 78% of Europe's cement production is from dry process kilns and an overwhelming majority of these kilns are suspension preheater kiln systems or suspension preheater/precalciner kiln systems.

Selective catalytic reduction (SCR)

Large NO_x emission reductions are potentially achievable by SCR high dust systems (85-95%). Pilot plant trials on small portions (3%) of the exhaust gas in Austria, Germany, Italy and Sweden have shown promising results. The NO_x emission levels were approximately 100-200 mg/m³ with no loss of catalyst activity, except for one recent trial in Austria that has reported considerable

abrasion of the catalyst after a working period of about 5000 hours which shortened the lifetime of this type of catalyst to less than one year. Full-scale production runs will have to be carried out in order to remove the technical and economic uncertainties related to upscaling of the SCR technique. The main uncertainties are related to the high dust concentration in the gases (up to 500 g/Nm^3), the catalyst dust removal techniques, lifetime of catalysts and total investment costs.

Up to now SCR is only tested on preheater and semi-dry (Lepol) kiln systems, but it might be applicable to other kiln systems as well.

As the catalysts remove hydrocarbons as well, SCR will in general also reduce volatile organic compounds (VOCs) and polychlorinated dibenzodioxins and furans (PCDD/Fs). According to one supplier, new pilot projects for NO_x reduction are being developed in which specific catalysts are applied for the additional reduction of VOCs and carbon monoxide (CO).

Considering the high reduction potential, the successful pilot tests and the fact that SCR is state-of-the-art technology for comparable installations; SCR is an interesting technique for the cement industry. There are at least three suppliers in Europe that offers full scale SCR to the cement industry with performance levels of 100-200 mg/m^3. However, results from the first full scale SCR installation in the cement industry is not yet available.

References

[1] European Commission, Joint Research Centre, IPTS, European IPPC Bureau. Reference Document on Best Available Techniques in the Cement and Lime Manufacturing Industries, March 2000.

[2] European Commission, Joint Research Centre, IPTS, European IPPC Bureau. Draft Reference Document on Best Available Techniques in the Chlor-Alkali Manufacturing Industry, Draft dated January 2000.

The BREF documents are available in pdf-format on the European IPPC Bureau (EIPPCB) web site at http://eippcb.jrc.es (Activities – select TWG (industry sector) – Documents and reports).

Figure 1 and 2 are from a presentation by M. Schneider, G. Hirth and P. Magel (VDZ, Germany) copied from the Proceedings of the International Workshop on Economic Aspects of BAT held in Brussels 10-11 February 2000.

Figure 3 is from the draft chlor-alkali BREF dated January 2000.

Session VI:
Continuation Examples

6.1 A BREF for the diverse sector of 'Large Volume Organic Chemicals'

Alex Radway,
European IPPC Bureau

Introduction

The Best Available Techniques (BAT) Information Exchange on Large Volume Organic Chemicals (LVOC) started in April 1999. Preparation of the BAT Reference document (BREF) is still in the early stages and there are not yet BAT conclusions that can be discussed at this conference. However, the nature of the industrial sector has presented some interesting challenges for finding an appropriate BREF structure. This paper outlines the chosen approach for writing a BREF to cope with the diversity and complexity of the LVOC sector.

Features of the LVOC industrial sector

The IPPC directive (96/61/EC) describes the organic chemical industry using a combination of functional chemistry (e.g. oxygen containing hydrocarbons) and general product groups (e.g. synthetic rubbers). However, nowhere does the directive use the term „LVOC". The term was initially coined by the Paris Workshop (CITEPA, 1997) who suggested that organic chemical production could be covered by three BREFs (LVOC, Fine organics and Polymers). In general terms, LVOC cover the following definitions from Annex 1 of the IPPC Directive:

> *„Production within the meaning of the categories of activities contained in this section means the production on an industrial scale by chemical processing of substances or groups of substances listed in Sections...*
>
> *4.1 Chemical installations for the production of basic organic chemicals, such as:*
>
> *a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic)*
>
> *b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides,*
>
> *c) sulphurous hydrocarbons*
>
> *d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates*
>
> *e) phosphorus-containing hydrocarbons*
>
> *f) halogenic hydrocarbons*
>
> *g) organometallic compounds."*

Although the LVOC sector is not explicitly defined, it is obviously extremely complex in terms of the numbers and diversity of products, and the range of production processes. Despite the limited number of elements involved in organic chemistry, it is estimated that there are more than 16 million organic compounds in existence [CITEPA, 1997]. Although only 60,000 of these compounds are manufactured world-wide and only a small proportion are

LVOC, this still represents an incredible number and diversity of products to include in a BREF.

Challenges for the BREF

A principal aim of every BAT Information exchange is to produce a BREF that is of practical value to regulators (in the writing of permits for IPPC installations) and to operators (in determining opportunities for improved environmental performance). To this end, the BREFs should be concise and contain information of practical value. BREFs should not be a huge encyclopaedia of generally available and theoretical information.

Such is the number of LVOC, that it is impossible to countenance an individual BREF for each separate chemical process (or product). This approach would be:

- Unworkable, in view of the available resources (of the EIPPCB, Member States and industry) and the timetable for BREF preparation (typically 2 years);
- Incompatible with the desire to produce concise BREFs of practical value; and
- Illogical, in view of the many commonalties between processes.

So the aim was to identify a BREF structure that would contain comprehensive and practical information, whilst remaining concise. These requirements would seem mutually exclusive, but a solution was first outlined by the Information Exchange Forum (IEF) and the Paris Workshop (CITEPA, 1997) and then further refined at the first meeting of the LVOC TWG in April 1999.

The chosen approach

The chosen structure for the LVOC BREF is a mixture of generic and detailed information that will be presented in three tiers, viz.:

- Tier A. Generic Techniques: General principles of management systems, unit processes, unit operations and infrastructure that are common to all LVOC production processes (also known as the „Family BREF“).
- Tier B. LVOC sub-sectors: Generic descriptions of the processes within each sub-sector (based on functional chemistry) with an outline of their environmental issues and appropriate techniques for prevention/control.
- Tier C. Illustrative processes: Detailed information on a small number of example processes (also known as the „Process BREFs“). .

Moving from Tier A to Tier C of the BREF will provide an increasing level of detail and a trend from qualitative to quantitative information. A verdict on BAT will be only reached for those processes described at Tier C, although Tier B aims to

give some generic indication of suitable techniques for the main pollutants from each sub-sector.

To a Member State regulator who is considering permit conditions for one of the Illustrative processes, the BREF will provide very specific information on production techniques, emission levels, control techniques and BAT. When permitting any other process, then the information in Tiers A and B provides the regulator with a toolkit of principles that can be used to formulate permit conditions synonymous with BAT. A more detailed description of these three tiers follows:

Generic Techniques (Tier A)

Although processes for the production of LVOC are extremely diverse and complex, they are typically composed of a combination of simpler activities that use similar equipment and principles. At an industrial level these common activities, equipment and principles are combined and modified to establish production processes for the desired product.

The core activity of a chemical production process is the conversion of raw materials into the desired product(s) using the necessary chemical reactions (Unit Processes) and physical changes (Unit Operations). This typically involves:

1. Supply and feedstock work-up. The receipt and storage of raw materials and ancillary reagents, and their charging into reactors.
2. Synthesis. The heart of the process is the chemical reaction that produces the product, often with the aid of a catalyst.
3. Product separation and refinement. The desired product is separated from the other components of the reaction (e.g. un-reacted feed, solvents and catalysts) and then purified of contaminants to the necessary specification.
4. Product handling. The storage, packaging and export of the product.
5. Emission abatement. The collection, reuse, treatment and disposal of unwanted liquids, gases and solids.

All production process are supported by complementary facilities, namely:

- A comprehensive infrastructure that interconnects the units (e.g. refrigeration, vacuum, pumps).
- An energy control system that produces steam or electrical energy for use in the process, and maybe cooling facilities.
- A management system that ensures the operation of the process under all scenarios. This can be viewed as the software to make all the hardware work.

Since the BREF cannot provide a comprehensive description of all the processes used to produce LVOC, it is important to understand the principles of unit processes, unit operations, site infrastructure, energy control and management systems. The BREF will therefore describe, in a generic manner,

the main features of these components as applied to the production of LVOC. Armed with this tool-kit of fundamentals it is then possible to have a basic understanding of any production process; to assess its potential environmental impact; and to consider suitable techniques for preventing and controlling emissions.

In addition to these generic LVOC techniques, there are a number of common process activities that apply widely across most industrial sectors. Rather than describe these activities repeatedly in many different BREFs, they have been segregated and will be addressed in „Horizontal BREFs" for:

- Waste water and waste gas treatment/management for the chemical industry
- Emissions from storage
- Cooling systems
- Monitoring of emissions
- Cross media and economic factors

As a general rule, Horizontal BREFs will describe the principles of common activities whilst the vertical BREFs will concentrate on their specific application. Therefore, in reaching a conclusion on what constitutes BAT for the production of LVOC it will be necessary to consult the relevant horizontal BREFs as well as the LVOC BREF. Of most importance to LVOC will be the Horizontal BREF on „waste water and waste gas treatment/management", and because of the potential overlap there is close liaison in the preparation of these documents.

LVOC sub-sectors (Tier B)

This tier of the BREF is proving to be the most difficult to write! It was introduced at the TWG to bridge what was perceived as a large gap between the generalities of common techniques (in Tier A) and the specific details of the Illustrative Processes (in Tier C). Without this Tier there was a concern that the BREF might have little value beyond permitting of the limited number of Illustrative Processes. The functional chemistry of LVOC and the classification system of the Directive give a logical sub-division into nine sub-sectors:

1. Lower Olefins	6. Sulphur compounds
2. Aromatics	7. Phosphorus compounds
3. Oxygenated compounds	8. Organo-metal compounds
4. Nitrogenated compounds	9. Other compounds (with more than one functional group)
5. Halogenated compounds	

For each of these sub-sectors it is the intention to give some practical, but generic, information on:

- Brief descriptions of the most commercially and environmentally important processes;
- An outline of the generic emissions that might be expected; and

?? An overview of applicable pollution prevention and control techniques.

Illustrative Processes (Tier C)

Such is the variety of processes in the field of LVOC that detailed BAT information exchange has been restricted to a very small number of Illustrative Processes. These illustrative processes have been chosen according to two main criteria. Firstly, that the process is of major industrial importance. In general, the largest volume chemicals have been selected because these usually represent the greatest number of plants and this ensures a good spread across Member States.

Secondly, the illustrative process should have environmental issues where information exchange is particularly valuable for operators and regulators. On the basis of these criteria the following eight illustrative processes have been selected for priority consideration:

SUB-SECTOR	ILLUSTRATIVE PROCESS
Lower Olefins	Cracking
Aromatics	Benzene/Toluene/Xylene (BTX)
Oxygenated	Ethylene Oxide; Ethylene glycols; Formaldehyde
Nitrogenated	Acrylonitrile
Halogenated	Ethylene dichloride (EDC); Vinyl Chloride Monomer (VCM)

There have also been requests for the inclusion of 2ethyl hexanol as an additional illustrative process in the „Oxygenated“ sub-sector, and TDI as an additional example in the Nitrogenated sub-sector.

The number and choice of Illustrative Processes has been a balancing act between illustrating some key issues of the sub-sectors, and having sufficient resources to write the BREF. A good technical case can be made for including more and different Illustrative processes, and any selection will always be open to debate. Future reviews of the completed BREF have already been identified as an opportunity to consider additional Illustrative Processes.

Conclusions

It is considered that this tiered combination of generic information and process specific detail provides a sound BREF structure to accommodate the diversity of the LVOC industry. A similar approach has already been used successfully in the BREF for Non Ferrous Metals, and this augurs well for the LVOC BREF. Based on this success, a similar structure is also envisaged for the three remaining BREFs for the inorganic chemical industry.

References

CITEPA (1997) Paris Workshop on best available techniques for the chemistry industry in Europe

6.2 Energy use and process integrated BAT measures

illustrated by examples from the
Non-Ferrous Metals Industries BREF

Ludwig Finkeldei,
European IPPC Bureau

Introduction

With the IPPC-Directive, adopted by the European Commission in 1996, a major cornerstone of European environmental legislation has been laid down. The Directive's aim is the protection of the environment as a whole by implementing an integrated approach to pollution control to prevent emissions into air, water and soil. This goes along with the objectives and principles of the Community's environmental policy in particular with preventing, reducing and as far as possible eliminating pollution by giving priority to intervention at source.

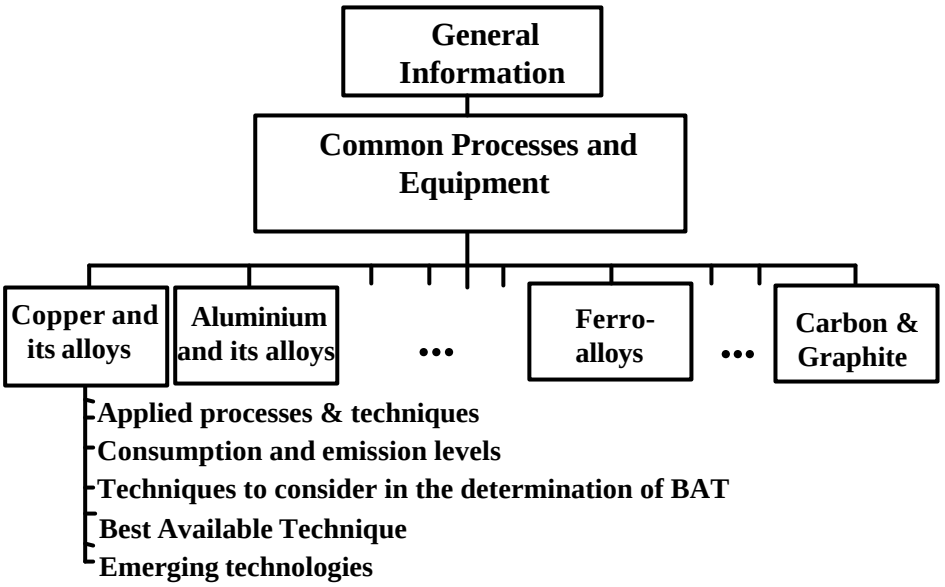
To fulfil these principles, the IPPC-Directive requires the use of best available techniques, both for industry to design and operate their plants and for competent authorities to set appropriate permit conditions. By determining those best available techniques, considerations concerning the nature, effects and volume of the emissions and the efficient use of energy should be taken into account. These considerations together with the IPPC principle of eliminating pollution by intervention at source emphasises among others process integrated BAT measures for the reduction of emissions and the efficient use of energy.

The present paper will now discuss process integrated BAT measures for the efficient use of energy and the reduction of emissions at source and the interrelation of both illustrated by examples taken from the Non-Ferrous Metals Industries BREF.

The non-ferrous metals industries BREF

The Non-Ferrous Metals Industries BREF presents the best available techniques for this industry as a result of the information exchange carried out according to Article 16.2 of the IPPC-Directive. The non-ferrous metals industry in Europe is a complex and diverse industrial sector. The production of 42 non-ferrous metals and the production of ferro-alloys were identified in countries that are obliged to implement IPPC. These metals have then been classified into 10 groups according to similarities in the production methods. The BREF has therefore been written vertically metal group by metal group, but with common processes and equipment being in an introductory chapter.

Figure 1: Structure of the Non-Ferrous Metals Industries BREF



There are many common aspects between the production of primary and secondary non-ferrous metals and in some cases it is impossible to distinguish between the techniques used. The BREF document on non-ferrous metals industries therefore combines the originally foreseen two BREFs on the production of primary and secondary non-ferrous metals.

As mentioned in the introduction this paper focuses on process integrated BAT measures for the reduction of emissions and the efficient use of energy. To demonstrate this I will refer to the part of the document covering the production of ferro-alloys where energy consumption and the emission of dust and fume are important issues.

The production of ferro-alloys

The term ferro-alloys refers more to its further use as a master alloy in the iron and steel industry than to its main alloying elements, which are to a large extent (up to approximately 90 %) non-ferrous metals. Ferro-alloys enable alloying elements such as chromium, silicon, manganese, vanadium etc. to be safely and economically introduced into metallurgical processes, thus giving certain desirable properties to the alloyed metal.

Their importance grew with the progress of the steel metallurgy, which implied more diversified alloying elements, in better-controlled quantities, in purer steel. The ferro-alloy industry became a key supplier to the steel industry.

Ferro-alloys are usually classified in two groups:

?? Bulk ferro-alloys (ferro-chrome, ferro-silicon together with silicon-metal, ferro-manganese and silico-manganese), which are produced in large quantities in electric arc furnaces (EAF);

?? Special ferro-alloys such as (ferro-titanium, ferro-vanadium, ferro-molybdenum etc.) which are produced in smaller quantities, but with growing importance.

Taking all of the alloys into account, the production of ferro-alloys represents with about 3.2 Million tonnes per year behind aluminium the second largest non-ferrous metal production in Europe.

Environmental key issues

According to the raw materials needed and the smelting process that takes place in large furnaces at high temperatures the production of non-ferrous metals has the potential for a significant environmental impact.

Production of ferro-alloys generally involves the use of electric arc furnaces (EAFs) into which raw materials (e.g. various metal ores, quartz, coke, lime, etc.) with relatively fluctuating physical compositions are loaded. Due to this, one of the major environmental impacts of producing ferro-alloys is the emission of dust and fume from the smelting process.

The electric arc furnace (EAF) is also a major consumer of electrical energy. Reduction of energy consumption has therefore always been regarded as a vital priority. The laws of thermodynamics, which govern the reactions used, limit the reduction of energy necessary for the smelting process. The reduction of the overall energy consumption is therefore in most cases only possible by recovering the energy content of the hot furnace off-gas.

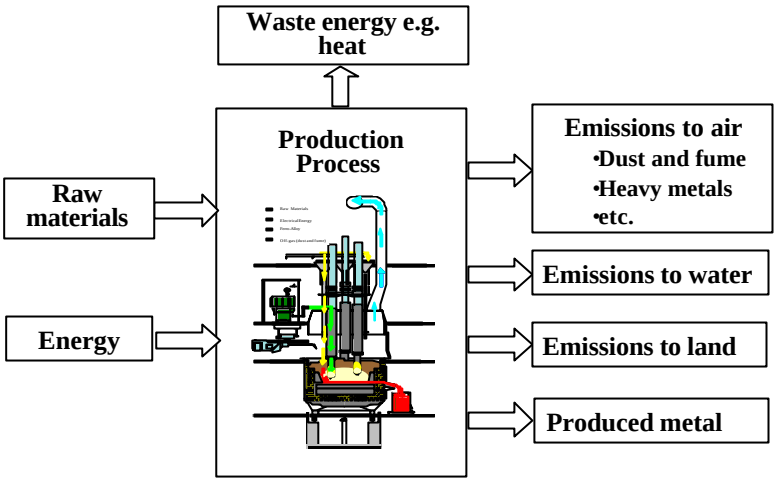
Concerning the energy usage, the disadvantage of the smelting furnaces used without energy recovery is the high amount of energy lost as CO in the off gas and as waste heat. For instance by producing ferro-silicon and silicon metal only about 32 % of the energy consumed is chemical energy in the product, that means about 68 % of the energy is lost as heat in the furnace off-gas [Schei, Tuset, Tveit, 1998].

Process integrated measures

Following the definition, best available technique shall mean the most effective and advanced stage in the development of activities and their methods of operation. In practical terms this refers to emission reduction and other environmental beneficial techniques that includes both end-of pipe techniques and process integrated measures.

Process integrated measures are technical or operational solutions that can be introduced directly in the production to reduce the environmental impact of a process at the source. To identify such techniques the core process should be examined according to its input and output mass streams.

Figure 2 Main input and output mass steams to an electric arc furnace



The reduction of both the amount of dust and fume emitted and the energy consumed by the process are linked as shown above by the smelting furnace as the heart of the process.

Process integrated measrues to reduce dust emissons

Reducing the emission of dust and fume at source means above all reducing the off-gas volume. For example, the ferro-alloy industry still uses open furnaces and retrofitting with an appropriate hood in order to change the open furnace into a semi-closed furnace will reduce the off-gas volume. By applying a nearly closed hood it is possible to limit the infiltration of air, but at the same time supply enough air to combust the CO generated in the furnace. This will then lead to the following effects:

- Reduced off-gas volume to be cleaned and consequently less dust emitted to air, which also means reduced specific emission factor for dust.
- Reduced energy demand for the filter plant.
- Reduced capital and operational costs for the filter plant
- Increased off-gas temperature up to 800 ºC and with that the possibility to recover the energy content from the hot off-gas.

Process Integrated measures to reduce the energy consumption

The operation of open furnaces leads to huge amounts of ambient air sucked into the furnace to burn the CO, which is generated by the smelting process. This consequently results in a very large volumetric flow of waste gas, which does not allow the recovery of its energy content because the temperature level is low (300 – 400 ºC) and the flow rate large to build technically and economically efficient heat exchangers. To recover as much as possible from the process energy the off-gas volume needs to be reduced. This can be done as already shown by installing a nearly closed hood to the furnace. A furnace

hood reduces not only the off-gas volume, it increases also the temperature, which then makes energy recovery by using a waste heat boiler possible.

The positive effects are:

- Recovered energy can be used to produce electricity that can be used on and off site. This energy needs then not to be produced elsewhere.
- Recovered energy can be used as steam on-site, in neighbouring mills or in a district heating system.
- The furnace hood can be integrated as superheater in the recovery boiler.
- The overall energy consumption of the plant will be reduced.

Due to the physical properties of the raw material some ferro-alloys like ferro-chrome and ferro-manganese can also be produced in totally closed furnaces. This reduces even more the off-gas volume, but generates off-gas that contains a high amount of CO. After dedusting the CO can be used as high quality fuel for a variety of purposes, which then combines the reduction of dust and the use of energy in a very efficient way.

BAT for process integrated measures

Taking into account the advantages mentioned before, providing the furnace with a nearly closed hood or depending on the raw material, closing the furnace completely, are regarded as process integrated BAT measures in the Non-Ferrous Metals Industries BREF for the production of ferro-alloys. Due to the increased off-gas temperature and in the case of the closed furnace, the presence of CO, both allow the operation of an efficient energy recovery system or utilisation of the energy content of the CO. A combination of the BAT process integrated measures for the furnace and the energy recovery is presented in the following table.

Table 1 Process integrated BAT measures to reduce dust emissons and energy consumption

Smelting furnace	Ferro-alloy produced	Applications	
		Abatement Technique	Energy recovery
Semi-closed EAF	FeSi, Si-metal, FeCr, FeMn. SiMn	Bag-filter (Dust < 5 mg/Nm³)	Production of electricity
			Production of high pressure steam and utilisation in the own of neighbouring plants
			Production of hot water
Closed EAF	FeCr, FeMn, SiMn	Wet scrubber due to the high off-gas temperature (Dust < 10 mg/Nm³)	Production of electricity
			Direct burning for drying, sintering, pre-heating, ladle heating etc.
			Utilisation of fuel in neighbouring plants
			Use in an integrated stainless steel production
Blast furnace	FeMn	Wet scrubber due to the high off-gas temperature (Dust < 10 mg/Nm³)	Production of electricity
			Utilisation in hot stoves (Cowpers)for pre-heating the combustion air

Requirements for implementation of process integrated BAT measures

As shown in the previous part of the presentation, the process integrated BAT measures for smelting furnaces and energy recovery go hand in hand. Otherwise, providing a furnace with a nearly closed hood without recovering the energy content from the high temperature off-gas requires an additional gas-cooling system, where then the main advantage of a semi-closed furnace has been lost. In the case of a closed furnace without energy recovery, the CO should be flared off, which indeed is a waste of energy.

According to the different furnaces (semi-closed, closed and blast furnaces) the metals produced and the infrastructure of a plant there are several options to recover and use the energy from the off-gas. Taking into account the considerations given by Annex IV of the IPPC-Directive especially the cost and benefits of the measures, there are a couple of BATs considered to recover and use the energy.

By implementing the above integrated BAT measures it is important to bear in mind that changing an open furnace into a semi-closed furnace or replacing the open furnace by a closed furnace and installing an energy recovery system means a large financial investment. This might probably be the most expensive financial investment a company can take. For the installation of a waste heat boiler we are talking about several million Euro. Due to the potentially high costs

and the important technical impact in the production process, a window of opportunity should be used to introduce such BAT measures. A smelting furnace can be operated without a major interruption for several years, and the time when the furnace needs to be significantly changed or replaced is the right moment to consider major changes. Also regular maintenance intervals or investment cycles might be used to introduce high costly investments.

As already mentioned, for the installation and operation of an energy recovery system several million Euro needs to be spent. The payback time for such an investment is then dependent on factors like local energy prices, times of operation and the presence of potential customers for the steam and hot water produced. Beside the cost of investment, the economic assessment should also take these factors into account, especially the price of electrical energy is the critical point in the timing of introducing these process integrated BAT measures.

Conclusion

Process integrated BAT measures in general take the first place in the hierarchy of techniques that will be taken into considerations to reduce the environmental impact of a production process. Such measures as demonstrated by closing a furnace cannot be seen in isolation neither from other process integrated measures like energy recovery nor from the plant infrastructure. That means for implementing BAT, if one integrated measure will be considered another measure, which is related to the first change, has also to be considered at the same time. In several cases this then requires in total a large financial investment, which again needs then to be taken into account to find the right time of introducing BAT. Different opportunities such as rebuilding or replacing a furnace as well as major maintenance interruptions might then be considered when making important modifications to the plant in order to implement BAT.

To illustrate process integrated BAT measures, as discussed for the production of ferro-alloys, there are a number of plants in Europe operating economically semi-closed and closed furnaces with recovery of energy or using the energy content in varies ways. Therefore these measures have been considered as BAT in a general sense. But due to the specific plant situations certain flexibility according to the different BAT options for energy recovery, the economic factors and the timing of introducing BAT should be emphasised.

References

Schei Anders, Tuset Johan Kr. and Tveit Halvard, (1998): "Production of high silicon alloys": *TAPIRedition*: Trondheim

European Commission, Joint Research Centre, IPTS, European IPPC Bureau, Farrell Frank and Finkeldei Ludwig, 2000. *Final Draft Reference Document on Best Available Techniques in Non Ferrous Metals Industries*, Draft dated February 2000. The Non Ferrous Metals Industries BREF has been posted in pdf format on the web site of the European IPPC Bureau (EIPPCB) http://eippcb.jrc.es (Activities – Non-Ferrous Metals Industries - Documents) and can be downloaded. The pdf format is readable if one has the Adobe Acrobat reader software.

6.3 Influence on smaller installations

illustrated by the Tanneries BREF and
the addressing of horizontal issues across
industry sectors in the Storage BREF

Ineke Jansen,
European IPPC Bureau

Smaller installations; the Tanneries BREF

Contents of the Tanneries BREF

The BREF on Tanneries is at the moment in process; the first draft was sent out to TWG members last year, and about 600 comments came back. At this moment the second - and probably last - draft is in process; this means adding new information and ammending the text due to the comments, where necessary or sensible.

The first draft was quite thin and contains rather general, mostly descriptive, information. Specific information or data are missing. The data in this BREF concerning emission and consumption levels are averages, not from one specific reference tannery, but averages representing several tanneries. The only categorisations made are whether the tanneries process cattle hides - sheep skins - or goat skins, and whether they perform chrome-tanning or vegetable tanning. There is no relation with production capacity. The average data represent small and big tanneries and thereby represent the whole tanning industry and not only the tanneries, which big enough to fall under the IPPC Directive. The best available techniques, to be defined in chapter 5, will mainly be based on expert opinion, rather than on data, due to the fact that data are only averages and that the data about costs are missing almost completely.

Despite the fact that detailed information is missing, the information that can be found in this BREF is a good description of the whole tanning process from the beginning through to the end together with a description of the main chemicals used and their impact on the environment.

The BAT to be defined will not only be process techniques but also possible substitutes for the main chemicals used that have an important impact on the environment. Also waste- and wastewater management will get a place in this document.

Why is detailed information missing?

There must be a reason why detailed information from those tanneries that meet the threshold is not made available for inclusion in this BREF. And perhaps there are more reasons but only two will be mentioned.

The threshold in the IPPC Directive

The threshold mentioned in Annex I of the IPPC Directive, concerning the tanning installations is not clear:

> "6.3. Plants for the tanning of hides and skins where the treatment capacity exceeds 12 tonnes of finished products per day."

And the following comparison will explain which strange effect this threshold has in practice.

- Tannery A produces shoe upper leather out of raw cattle hides in a chrome tanning process. Typically 200 kg leather is produced out of 1 tonne raw salted hides.
- Tannery B produces shoe soles out of raw cattle hides in a vegetable tanning process. Typically 650 kg leather is produced out of 1 tonne raw salted hides.
- Tannery C produces wet-blue out of raw cattle hides. Typically 850 kg wet-blue is produced out of 1 tonne raw salted hides.

To meet the threshold of 12 tonnes finished products per day, tannery A needs to process 60 tonnes raw hides, where tannery B needs to process 18.5 tonnes of raw hides and tannery C only 14 tonnes. The figures are calculated from [FAO, 1992] and [ICT, 1969].

This is because for tannery A "finished products" means cattle hide turned into leather with a product water content of about 8% and usually coated, where for tannery B "finished products" consists of leather, which is made very heavy and contains about 40% vegetable tannins. Tannery C's "finished products" is soaking wet, chrome tanned leather, which is going to be dyed, dried and probably coated elsewhere.

It might be clear out of these examples, that the tanning industry is very unsure about when a tannery falls under the IPPC Directive or not. So for the TWG members, responsible for submitting the data to be put into the BREF, it is almost impossible to give data concerning only those tanneries that fall under the IPPC Directive.

Competitiveness

Another reason for the lack of detailed information is the fear of industry that once the information is published, it will affect their competitiveness. The tanning industry is a industry with a long history and although the EU still is the world's largest supplier of leather on the international marketplace, the total number of tanneries continues to decline [EU,1997]. Competition with countries inside, but also outside the EU is large. And for this reason companies are not very keen on submitting information that might be turned to advantage for competitors.

This BREF and smaller installations

Due in part to the above mentioned reasons, this BREF is not as detailed as intended. On the other hand, it addresses the whole industry and not only the biggest companies. And therefore the information in this BREF is suitable to use for every type of tannery. This outcome might turn to be a big advantage of this BREF, not only for the permit writer, but also for the industry and even for the environment.

Because instead of writing a BREF that only addresses the companies meeting the threshold, this BREF can be a very useful instrument for the permit writer for every type of tannery; big or small - falling under the IPPC Directive or not.

Industry could also benefit in that every tannery should be able to find useful information in this BREF. Industry, by means of their TWG members, is heavily involved in this whole process and they have submitted, and still are submitting, an important part of the information. Implementing BAT, whether required by regulation or even voluntarily, does not always mean higher cost. There can be some savings when for example chemicals are saved or less waste has to be disposed of.

When this BREF is used for writing permits for all tanneries, because the information in it is suitable to do so, it can also be an advantage concerning the environment. Even so it might be that because detailed information is missing, the BAT related emission level values are probably not as ambitious as possible. But than a major proportion of the whole industry is probably able to apply the defined BAT's in this BREF.

The message

The message is that this BREF on tanneries can be a useful instrument considering the tanning industry as a whole. But not without the warning that this of course means not copying the BAT conclusions into a permit without any sense or any consideration of the local situation and specific conditions in the individual case.

The addressing of horizontal issues across industry sectors; the Storage BREF

Horizontal BREF

Where the vertical BREF addresses one specific industry sector and stems from the descriptions of activities in annex 1 to the IPPC Directive, a horizontal BREF addresses a specific issue that concerns many different industries. At this moment all the foreseen horizontal BREF's are in progress and are concerning the following issues:

- Industrial cooling systems
- Monitoring systems
- Common waste water and waste gas treatment/management systems in the chemical sector
- Emissions from storage of bulk or dangerous materials
- Economic and cross media issues

Except for the common waste water/ waste gas BREF, which only address chemical industry, all other BREF's concern all relevant industries of annex I of the Directive. The fact that those BREF's are all horizontal ones, does not mean that they will be processed in the same way. There are differences in processing the several vertical BREF's, but the differences in processing the horizontal ones might be even bigger. There are topic-related problems and problems related

to the horizontal aspect. This will be explained on the bases of the Storage BREF and where possible compare this with other horizontal BREF's.

The work on the Storage BREF is just started. The Kick Off Meeting was held in December last year. Although the TWG has discussed in this Kick Off Meeting what topics will be addressed, there is always the possibility that during elaborating this BREF, ideas will have to be changed for what reason ever. Some problems specific for horizontal BREF's have already arisen.

Horizontal - related problems

Addressing all industries falling under the IPPC Directive means addressing at least 27 different kinds of industries, where a vertical BREF is planned to be written for, or is already written. This means in practice that every Member State will have to look for one or two TWG members that are experts on Storage, but related to 27 different kinds of industries. But especially industry has difficulties in finding the proper representatives for the Storage TWG and not because there are no experts on storage, but experts representing the several industries that are involved, that's the problem. One umbrella organisation for all the different industries that it concerns does simply not exist. UNICE (Union of Industrial and Employers' Confederation of Europe) is represented in the Storage TWG, but also UNICE is not the umbrella organisation over every industry.

At this moment new representatives of industries that might be affected by this Storage BREF are being added to the TWG.

Another problem specific for the horizontal BREF's is what level of detail can be achieved. Let's again consider the Storage BREF. Imagine how many different substances there are stored in 27 different industries and in how many different ways you can store all these. You don't have to be an expert on storage to see that this BREF cannot consider every single substance, not even when you would focus only on the dangerous substances. Because than you will run in to the question what will have to be considered dangerous? Milk for example is a harmless not toxic substance until it floats in big amounts into a little river; the high oxygen demand will have a disastrous effect.

In the Storage BREF this problem will probably be tackled by creating categories of substances that require in general the same storage equipment.

Topic - related problems

Take for example the BREF on Cooling Systems, which deals with all kinds of cooling systems used in all kinds of industries. A cooling system is not a part of an installation that you can see apart from the production process; it is completely integrated. So when you want to change the cooling system for environmental reasons, this will have almost always a direct impact on the production process. This means that it is very difficult to define BAT for a cooling system in a horizontal BREF, because it is impossible to consider every specific production process.

The BREF on Storage will probably not be faced with this problem, because storage is not integrated into the production process to the same extent as

cooling systems. Storage can much easier be seen as an activity apart from the production process and sometimes this is also made visible on a plant site when special tank-parks are created.

How to use the Storage BREF

To avoid duplication of work, for the sake of consistency and to make the use of the several BREF's as easy as possible, the staff of the European IPPC Bureau and the Storage TWG made an agreement. The goal of the TWG on Storage is to define BAT concerning general principles for storing and handling categories of substances. Those BAT-conclusions will be taken over by the experts of the IPPC Bureau in the vertical BREF's and where necessary, for example because specific substances or specific storage facilities have to be considered for a specific type of industry, detailed information is added.

This is the ideal situation. But there are already vertical BREF's finished or will be finished before this Storage BREF is; in those cases this structure is missing. So for the time being, the user of the BREF - most times the permit writer- has to check both the documents, the industry specific - vertical - one and the Storage BREF to be sure of having all the information about BAT on Storage. For the time being means until the next review, with a frequency of five years. This means that with the review of the already finished BREF's, the agreement of how to cope with the topic 'storage' also will have to be kept.

Writing BREF's is a rather young process and agreements like the above mentioned one, about how the several BREF's can be used with regard to each other, will help to develop clear borders and simplify the use of the range of BREF's that will be written. Eventually we hope to develop the series of all BREF's to be available electronically, for example on CD rom to make it easier to get the required information from the vast amount in the whole series of BREF's.

Bibliography

FAO, Food and Agricultural Organisation, (1992): "Global Compendium on conversion factors for raw hides and skins and leather.

ICT, International Council of Tanners (1969): Conversation Factors for Hides, Skins and Leather based on an enquiry of member countries.

EU, European Commission (1997): Panorama of EU Industry

Session VII:
Approaches to implementation

7.1 The UK approach to use the BREFs at national and installation level

Martin Quinn,
Environment Agency, Great Britain

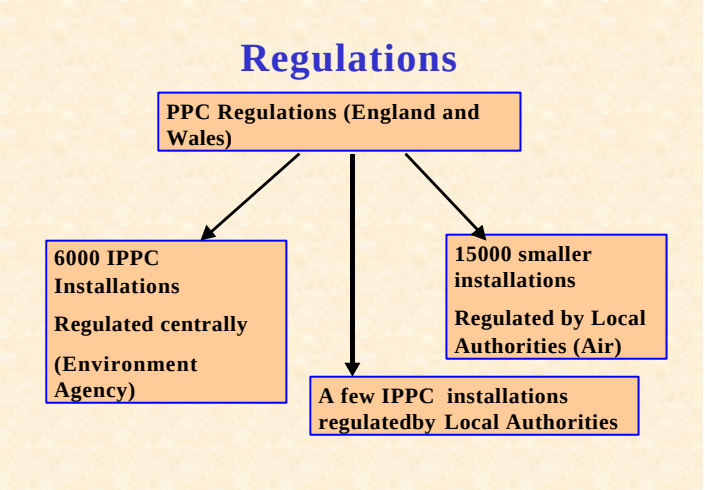
This presentation covers:

- progress of IPPC in the UK
- how we are using the BREF to determine BAT at both an installation level and a national level.

In the UK we have put an Act of Parliament in place to deliver the IPPC Directive. This gives powers to the Secretary of State to make Regulations. The Regulations, called the PPC Regulations, should be in place by July.

The Regulations actually cover more than IPPC. In addition to the 6,000+ IPPC processes which we will be regulating with the Central Environmental Agency, the Local Authorities also deal with many smaller processes, for air emissions only, under the same regulations.

This slide shows the situation for England and Wales. However, like many other countries, we are a set of devolved nations – Scotland manage their environmental matters slightly differently and, although they will have similar regulations, the Scottish Environmental Protection Agency will deal with all of the processes on the slide centrally.



We've had a number of consultation papers - 4 to date - covering the introduction of IPPC, the Regulations and the phasing in of the industrial sectors. There is a fifth consultation due shortly and you will be able to see that on the Government web site www.detr.gov.uk.

We expect to be phasing in the industrial sectors progressively starting from the end of this year through to 2007. The phasing programme has been arrived at following the consultation and also takes into account existing review periods and most significantly, the likely dates for the completion of the BREFs.

Within the UK we are putting considerable effort into improving the operational systems to deliver IPPC for:

- applications/permitting/guidance,
- compliance,

?? monitoring,

?? enforcement,

?? data management and IT systems,

?? permitting trials,

?? training,

?? etc

In particular I draw your attention to the permitting trials which we have been carrying out with a number of different industrial sectors to try out the application and permitting process and iron out any problems before the introduction of the sectors.

In addition, training is particularly important for us. Because we determine BAT at the installation level it is important that our officers are well trained. They will need training in particular for noise, energy, site restoration and accidents which are aspects for which they have not been dealing with so far. New staff will need training in the costs and benefit assessment of BAT at the installation level.

We have an IPPC implementation team of 8 people who are managing the introduction of IPPC into the UK but they, and their budget of some 600k per year, is only a small part of the total effort being put in both from the regulators and from industry.

BAT at the national installation level

I would like to look in particular at this question of the determination of BAT at a national or local level because within the UK we are somewhat changing our thinking.

Many of you will be aware that, in the UK, we have had a permitting regime for many years which is very similar to IPPC. We call it IPC. This regime is not quite as extensive as IPPC, for example it does not cover quite so many sectors and it does not cover all of the aspects such as noise, energy, accidents, site reporting etc. Nevertheless we operated the system exclusively by determining BAT at the installation level.

We did this by the use of national guidance which

contained bench marks in a very similar way to the BREFs. These were used to support the judgement of the local inspector.

I am sure you aware of **why** we determine the BAT at local level. The IPPC Directive clearly states the need to take account of the technical characteristics, the geographical location and the local environmental conditions. With our previous regime it was the air framework directive which gave a similar steer.

Sometimes people believe that a determination of BAT at an installation level could be an easy option ….. that a company might not be made to make an improvement if they could not afford it.

Article 9

….. the emission limit values ….. shall be based on the best available techniques but taking into account the **technical characteristics** of the particular installation concerned, its **geographical location** and the **local environmental** conditions.

NO!.

This is definitely not the case. Not only did IPC (the UK's old system) lead to environmental improvements costing some £0.5bn per year the system also requires considerably more effort from both the operator and the regulator.

The factors that are taken into account in determining BAT at the local level are primarily the technical characteristics, the geographical location and the local environment. Costs are taken into account but they are those which are appropriate in a sectoral sense such as £/t of pollutant avoided or reasonable expenditure in the context of that sector.

In addition the investment cycles of a particular company may be taken into account in deciding the timing of an improvement. That is because timing an improvement to coincide with changes planned by the company anyway, will cost less, and therefore the cost and benefit balance of BAT is more likely to show that the improvement is BAT.

Installation specific philosophy - in summary

- **more sensitive protection of the local environment**
- **prioritises expenditure, to maximise pollution avoided for each £ spent.**

In summary, the installation specific approach allows more sensitive protection of the local environment and also enables the operator to prioritise expenditure to maximise pollution control for each £ spent. In other words it allows industry to be

competitive while still protecting the environment.

The question is, will we continue to determine BAT for every installation individually under IPPC?

For us IPPC brings in a number of smaller but more numerous installations which are very similar in nature but individually have a relatively low impact. In this category would be many of the surface treatment installations and, possibly, agricultural installations. In these cases the UK regulator is working closely with industry on the potential for the development of General Binding Rules (GBR) at a national level.

Within the UK, the approach we are currently considering would be for the General Binding Rules to be optional. The operator could choose an installation specific permit if the **technical characteristics** of the installation did not fit the GBR.

Equally the **local environment** would be protected by conditions in the rules ensuring that as a minimum, the installation would not be close to causing a breach of an environmental quality standard or be a significant contributor to such a standard. (This would include the many standards defined by the Environment Agency which cover some hundreds of substances). If the regulator is not convinced that the local environment would be adequately protected by a GBR permit then an installation specific permit would be needed.

?? The advantage to the operator of the GBR would be:-

?? the potential for lower charges

?? much less time spent preparing applications (noting that 50-100 man days was not uncommon for a large installation under IPC)

?? greater certainty for planning purposes.

However, the standards for General Binding Rules must be right and they must be challenging. The aim, for us, is to develop general binding rules which persuade the operator to go further in terms of environmental protection in return for the advantages.

IPPC UK Guidance
Route map through making a good application containing:

- clear structure
- clear indicative standards (member states view) based on BREF
- clear upgrading timescales
- how to meet other legislation which needs to be delivered through IPPC (eg Waste Framework Directive, Habitats, Groundwater etc)

How do we use the BREF?

In answer to this, we could just give the BREF to our inspectors. However, the BREF is guidance to the Member State and we believe that it is necessary for the Member State, in this case the UK, to give a clear steer of its expectations to both regulators and operators. It is also necessary to take account of other legislative influences in the IPPC permit. In the the UK, the Waste Framework Directive, the Ground Water Directive and the Habitats Directive are all given effect, in a "one-stop-shop" approach via their IPPC permit.

In addition, from our experiences with IPC, there are a number of significant improvements that can be made for the permitting process for the benefit of the operator, the regulator, the public and ultimately, of course, the environment. We have therefore produced some national guidance, **to support the BREF,** with the following aims:-

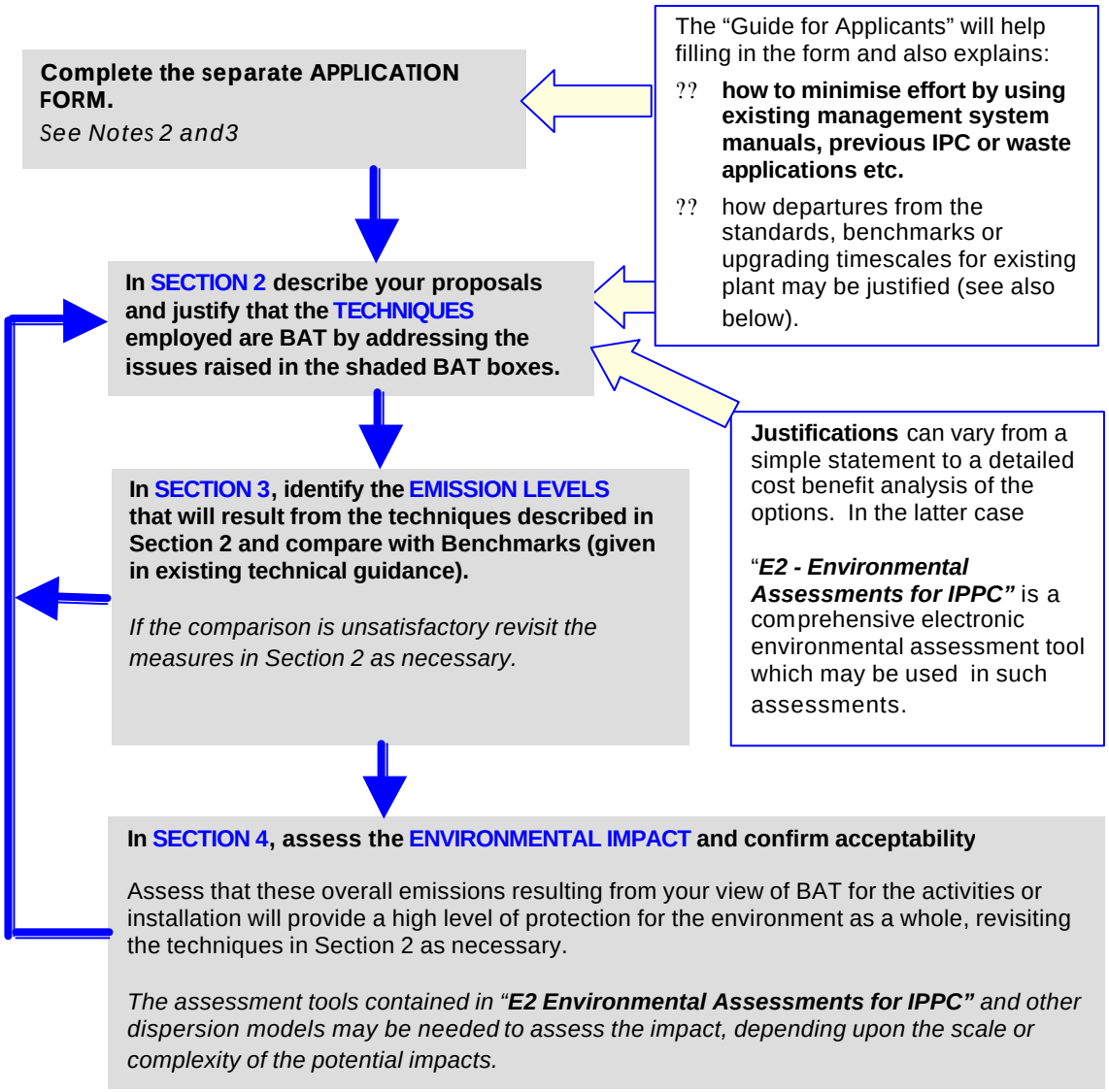
- to cut down the time for the operator to make an application and for the regulator to assess it,
- to improve the transparency of the process from the BREF through the guidance and application to the permit,
- to improve the consistency of permits and the assessment of that consistency,
- to improve the quality of applications
- to ensure that the standards in the BREF are actually addressed by the applicant
- to improve the clarity of the BAT process and
- to provide a structure for subsequent compliance assessment.

We have decided to deliver this by a more structured approach through the guidance to the permit. The UK IPPC guidance is in effect a "**route map**" to help the applicant make a good application. It cross refers to the BREF for detail and contains:-

- a clear structure
- clear indicative standards (the member states view) based on the BREF
- clear upgrading timescales for existing plant
- how to meet other legislation which needs to be delivered through IPPC (eg. the Waste Framework Directive, the Habitats Directive and the Groundwater Directive)

Figure 1 shows the logic which the applicant is expected to follow making his application and Figure 2 an example page from the guidance.

Figure - Making an Application



The guidance package including

?? the application form,

?? notes for filling in the administrative parts of the form

?? guidance based on the Pulp and Paper BREF

?? general guidance for use where a BREF has not already been produced.(this will rely upon existing UK guidance)

?? draft permit

are being consulted upon over the next few months and are available on the Environment Agency's web site www.environment-agency.gov.uk..

In addition we are also updating our more detailed cross cutting (horizontal) guidance on subjects such as

?? BAT costs and benefits assessment

?? noise,

?? energy,

?? site reports,

These will also be on the Environment Agency's web site. as they become available.

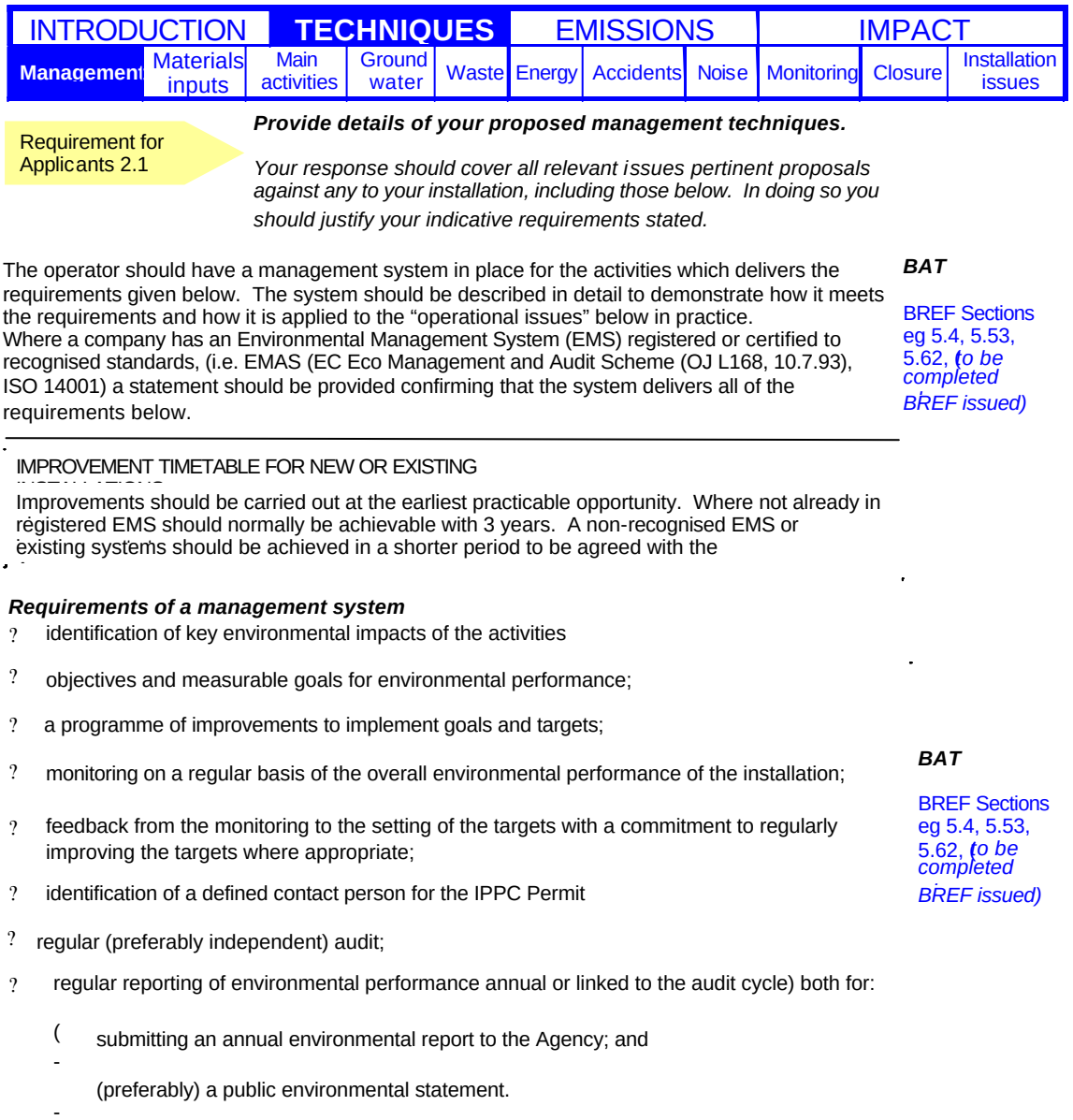
In conclusion, the UK is very pleased with the BREF process which is providing us with a firm foundation for regulation and is significantly changing the way in which we handle industrial pollution.

We are impressed with the degree of consensus achieved in so many sectors already. Some believe the standards to be too tight others that they are too relaxed. There is no doubt, however, that no mechanism for environmental legislation has created so much impetus and consensus for environmental improvement in such a short time. If most of EU industry meets the BREF standards within the next few years, the process will have achieved far more than any other regulatory initiative could hope to achieve.

The UK also recognises that the process itself has value beyond that of the documents and standards themselves, in that it brings so many sectors together thereby raising awareness of the environmental improvements which can be achieved.

Subsequent reviews of BREFs will no doubt improve the performance of EU industry still further. The wide consensus also means that the BREFs will have a major influence on pollution control well beyond the EU.

Figure 2: Example page for section 2 of the guidance for BAT techniques, ofr which management techniques are just one aspect.



From UK experience it must be stressed that, despite the presence of the BREF, there is still a requirement for a considerable amount of effort at a national and local level if IPPC is to be implemented successfully.

7.2 Dutch guideline based approach to introduce the BREFs

Lex de Jonge,
Ministry of Housing, Spatial Planning and Environment, The Netherlands

Dutch guideline based approach to introduce the BREFs

Lex de Jonge

Ministry of Housing, Spatial Planning and the Environment

Dutch framework on environmental policy/legislation

- National Environmental Policy Plan
- Environmental Management Act
- Reference documents for guidance
- Covenants
- Emission reductions trading
- (Questions for the European Commission)

Environmental Management Act

- Procedural act (quite similar to IPPC)
- Provides legal basis for:
  - individual permitting
  - decrees (= general binding rules)
  - ALARA (as low as reasonably achieveable)
- ALARA: Prevent pollution or, if this is not entirely possible, apply highest level of protection against environmental pollution, unless not reasonable (quite similar to BAT)
- Judge-made law defined freedom ALARA

Court of appeal: judge-made law

- Application of ALARA offers permitting authority some freedom / flexibility
- This freedom is restricted by environmental (including economical) opinions derived from **most recent and general accepted** environmental views, as laid down in guidelines, reference reports, etc
- Guidelines have to be taken into account

Reference document for guidance

- Netherlands Emission Regulations (NeR):
  - issued in 1992
  - principal derived from TA Luft
  - based on ALARA
  - general applicable emission standards
  - specific regulations for specific processes
  - not direct legally binding, but…
  - divergencies justified in recital of permit
  - NeR is pseudo-legislation with flexibility

Position of IPPC BREFs in NL

- NL: IPPC BREFs useful instruments to secure high level of protection of the environment and achieve level playing field
- High level of protection = Focus on "maximal application" of all BAT options
- BREFs are considered "**most recent and general accepted** environmental views, applicable for protection of environment" ---> automatically applicable ALARA

Practical approach

- BREF compared to NeR specific regulation and other national guidelines
- Cover note to BREF describing differences
- In many (?) cases the NeR specific regulation will be withdrawn
- BREF + cover note will be disseminated to all permitting authorities: "**most recent and general accepted** environmental views"
- BREFs also for OSPAR implementation

Covenants and emission trading

- Covenants include obligation to apply BAT and thus BREFs
- NOx emission reduction trading:
  - under development
  - most cost effective NOx reduction
  - NOx emission standard on plant level in g/GJ
  - all rules and obligations laid down in decree
- Art 9.8 IPPC accepts decrees for implementing BAT

Questions for the Commission

- To what extent is BREF legally binding in IPPC directive?
- How to prevent “minimal” (in stead of “maximal”) application of all BAT options?
- Ideas on enforcement on a European level?

7.3 Practical use of BREF in permitting

Danish pilot project on the implementation of the IPPC project in Bulgaria.

Jørgen Friis,
Funen County, Denmark

Angel Kostov,
Ministry of Environment and Water, Bulgaria

Project presentation

Upon agreement between the environmental ministers of Bulgaria and Denmark a project on approximation of the EU IPPC Directive in Bulgarian legislation was formed.

In the practical implementation we have used the experience from Denmark, where integrated permitting has been used since 1974, from Ireland, where the BAT concept is very well developed, and from Estonia where the implementation of the IPPC Directive is a little bit ahead of the process in Bulgaria.

In the following we will focus on the part of the project which is the practical implementation involving production of guidelines to industry and authority, and training of the authority personnel.

Elaboration of guidelines

Two guidelines were produced:

One Application Guideline for the industry and their consultants, giving detailed information on what to include in an application and how to organise the information. Empty tables are enclosed.

One Permitting Guideline for the authority, giving detailed information on how to evaluate the application, and how to structure the permit.

The basic ideas are as follows:

- Integrated approach
- One application is send to one authority
- One permit is written covering all media
- The application forms a part of the permit
- Application and permit have the same numbering system
- The guidelines are supplemented by two real permits as examples

Testing the guidelines

Two companies, a coal fired district heating and power plant and a tannery, were asked to produce an application based on the guidelines and the relevant Draft BREF document in the case of the Tannery.

For the time being no EU reference document for BAT for large combustion plants has been elaborated.

Emission limits for new power plants can be found in EU's LCP directive (88/609/EEC). This directive stays according to the IPPC directive valid until December 31, 2003. The LCP directive does not contain emission limits for existing power plants, but it could be expected that existing plants will have to

fulfil the requirements of the directive within a 8 year period following the IPPC directive's article 5.

BAT for large combustion plants is described in „Revision of the EC Emission Limit Values for New Large Combustion Plants (>50 MWt), January 1996, Commission of the European Communities."

A literature searching has not made more resent or more authoritative documents appear.

During the company's elaboration of the application the BREF document was used for benchmarking the company, as inspiration for future planning, and as a frame of reference towards the authority.

The authority used the BREF to get a general knowledge about tanning technology, and as a frame of reference for the assessment of the application.

Structure of the IPPC permit

The permit was structured in four major parts each aiming at a special target group:

A. General information
B. Summary (popular target group)
C. Evaluation (technical target group)
D. Terms for the production (technical and legal target group)

General Information

The general part tells you what it is all about, how the case has been handled including involvement of the public, and how a possible complaint can be brought forward.

Summary

The summary is written to the general public.

It contains a short description of the activity applied for, permits and licenses in force, a short overview of the main environmental pollution, and comments from other stakeholders, such as the municipality, labour inspection, NGO's, public hearings etc.

Evaluation and Terms

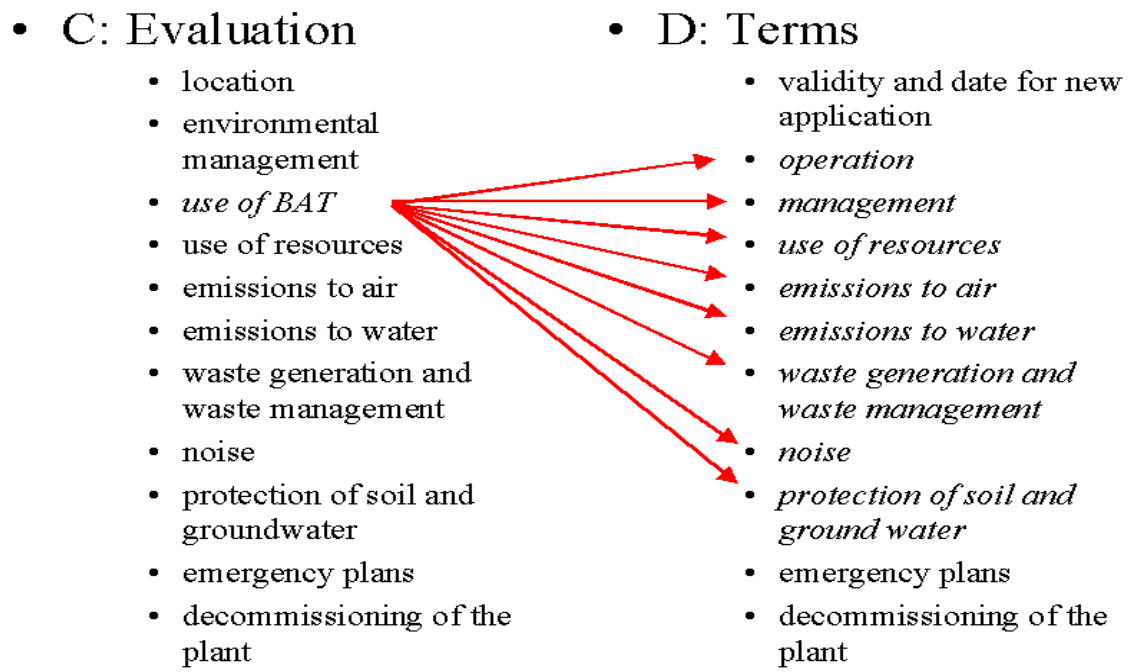
In the evaluation part of the permit, there must be arguments for all the terms.

Here we have decided to give the evaluation of the implementation of BAT a special chapter to emphasise the importance of this assessment.

On the other hand we do not have special terms on BAT, but found it more manageable to let the implementation of BAT find expression in the terms covering emission limits, operation, management and the use of resources.

Questions regarding environmental- and general management of the company we have given a separate chapter, although this is also a part of the BAT concept.

Figure 4: Evaluation and Terms



How to use BREF in the Permit

When evaluating the BAT for the applicant, it is important that the applicant and the authority makes reference to the actual BAT Reference Documents used, and argue for the choice of document.

In the comparison of the applied production to the BAT notes we are first looking at the possible substitution of dangerous substances, and then on the technological processes.

It shall be described which dangerous substances are used in the production, and what should be done in terms of substitution to reach BAT.

It shall be described which processes are used in the production, and what should be done to reach BAT. A subdivision of this paragraph into single processes can be useful for clarification.

All new productions shall apply BAT according to the definition in the IPPC Directive.

For existing companies it should be described:

?? whether the process uses BAT and if not - why not

?? which terms in the permit that will ensure that an action plan towards BAT will be mandatory for the enterprise

?? the time limits and why it is necessary to give the enterprise time to apply BAT

Examples on Terms on BAT

Substitution

The company is not allowed to use:

?? surfactants based on alkylphenols or including any other endocrine disrupting substances;

?? chloroorganic compounds, solvents in the leather production, volatile organic substances, complex forming substances, formaldehyde;

?? syntans of high toxicity and with high monomer content;

?? dyestuffs that content heavy metals or which are in the list of azo-substances that can release carcinogenic amines after reduction;

?? chrome tanning salts containing Cr(VI)

?? aziridines, isocyanates

The company should report its findings about the possibility to change sulphide with enzymes in the annual report.

Process

In the old shop they can continue to use ammonia deliming systems but in case of replacement of the equipment, the company should install equipment relevant for CO2 deliming.

When having excess capacity in the new shop, production should be moved there from the old shop.

Conclusion of the project

When the authority had finished writing a draft of the permit it was negotiated with the company.

Finally the companies were giving comments on the guidelines, and the guidelines were rewritten according to the experience gained during the project.

How did Bulgaria benefit from the project

Staff from the ministry of environment and water, and staff from the regional inspection of environment and water were trained in IPPC permitting based on Bulgarian realities.

A list of IPPC companies in Bulgaria was elaborated.

A cost analysis for BAT implementation in two industrial sectors (tannery and district heating) were made.

Field testing of IPPC application form and permit template, including guidelines for their use.

Two IPPC permits for existing plants were elaborated.

An action plan for transposition and implementation of IPPC in Bulgaria was made.

How will IPPC be implemented in the Bulgarian legislation

A new Environmental Protection Act is to be adopted by the Parliament within the next year introducing an integrated permitting regime covering all environmental media and in the mean time amending the present Clean Air, Waste Management and Water Acts by repealing the corresponding single media permitting provisions.

The Directive will be fully transposed with a New regulation on integrated pollution prevention and control under this new act. The present emission limit values based on the above sectoral acts will stay in force as a minimum requirements when issuing an IPPC permit

Final remarks

After this project, Denmark has implemented the IPPC Directive, and the experiences gained in Bulgaria has been used in training Danish officials in permitting. And Bulgaria is planning IPPC permitting of the country's 5 largest industrial enterprises based on the developed concept in the near future.

We have been happy to shear our experiences with you, and we do hope you can benefit from it.

7.4 Integrated Assessment on a Local Level

Dr. Barbara Reiter,
Federal Ministry of Agriculture, Forestry, Environment and Water Management, Austria

National discussions regarding the application of the IPPC Directive have shown that, in addition to the determination of the best available techniques for the various sectors, there is also a need for a methodology for "Integrated Assessment on a Local Level" (Article 9(4)), in order

- to assess the actual effects of a concrete project in the light of the local environmental conditions,
- to evaluate the permittability of a submitted project, and
- to determine the conditions of the permit according to the provisions of the IPPC Directive or the national legislation enacted to transpose it into national law.

The IPPC Directive requires that the permitting of an installation include the provision of measures necessary to implement integrated pollution prevention and control in order to achieve a high level of protection for the environment as a whole.

In order to give methodological support, a guidance manual has been developed under the direction of the Ministry of Environment, the basic structure of which is briefly presented in this contribution.

The guidance manual is addressed both to competent authorities and to plant operators. However, the manual is not legally binding but, rather, has the character of a recommendation.

The guidance manual distinguishes between two levels:

- principles that are generally valid and, hence, apply irrespective of the location, and
- consideration of the local situation.

General principles

- Preventive measures must be taken against pollution, in particular through application of the best available techniques (includes compliance with emission limit values)
- No significant environmental pollution must be caused (includes compliance with environmental quality standards)
- Waste production must be avoided, otherwise waste must be recovered or disposed of properly
- Energy must be used efficiently
- Accidents must be prevented and/or their consequences limited
- Measures must be taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state

These general principles are intended to ensure that, **irrespective of the local situation,** no obsolete technologies are applied and consideration is given to

the precautionary principle. The principles were formulated in accordance with Art. 3 of the IPPC Directive, i.e. the basic obligations of the operator, and Annex IV of the Directive.

Forms were developed for the guidance manual, which the party applying for the permit can use, in the application process, to demonstrate compliance with these general principles. However, the forms can also be employed by the permitting authority to verify compliance with the general principles.

Consideration of the local situation

As already mentioned, the guidance manual is to assist in the evaluation of the local situation and the impacts of the plant on these local factors.

It was our objective to facilitate an overall view of all environmental media and to focus attention on possible conflicts between the local environmental situation and the effects of the project.

In order to facilitate the overall view of all media, grids as shown below are used to address different questions, such as initial pollution and additional pollution:

	Emissions to / foreseeable environmental effects by				
	Air	Water	Soil	Waste	Other (e.g. waste heat)
Local protected interests					
People in settlement A					
Groundwater					
Forest area					
Air quality (ozone precursors)					
...					

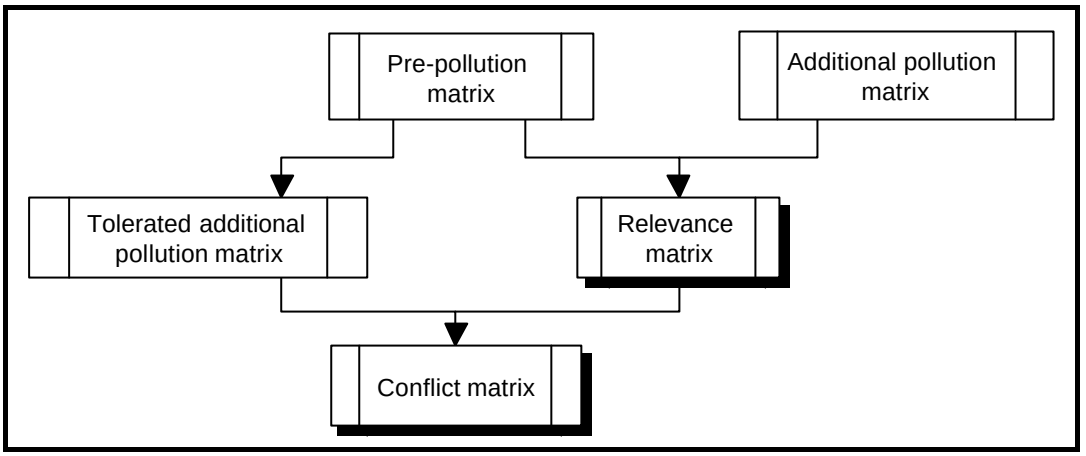
The locally relevant protected interests are selected from a catalogue of possible protected interests. Within the individual grids, the assessment is performed by experts, meaning specialists from the competent authorities. The assessment values are to be classified as semi-quantitative. The values 0, 1 or 2 can be used.

The key element of the method is the identification and elimination of areas of conflict. A conflict exists if, taking the initial pollution into account, the competent authority finds that a local protected interest is affected by the

project to an extent as to make it unjustifiable. Conflicts are characterized in a "Conflicts matrix".

The **approach used to generate the Conflicts matrix** is outlined in the illustration below.

Figure 1: Method for the generation of the conflict matrix



Initial Pollution matrix: What burden are the various protected interests already subject to? The main focus will be on pollution factors that would subsequently be influenced by the project. However, in order to take into account possible interactions, excessive burdens which presumably would not be influenced by the project should also be listed. This can also be of benefit in the case of possible considerations to modify the project. An assessment value of 2, for example, would mean high initial pollution whereas an assessment value of 0 would mean no or only a low level of initial pollution.

Additional Pollution matrix: What foreseeable impacts on the local protected interests are estimated to result from the project-specific pollution?

Tolerated Additional Pollution matrix: What additional impacts on the local protected interests are regarded as justifiable?

As work with the method progresses, the individual matrices are also applied to the level of individual pollutants.

In order to preserve clarity and to focus attention on the main pollutants or main impacts, a **Relevance matrix** is generated by combining the Initial Pollution matrix and the Additional Pollution matrix. If both the initial pollution load and the additional pollution load are classified as low, the respective pollution pathway no longer appears for a selected protected interest. Here, the expert judgement of specialists is of great importance, since possible interactions must be considered before a pollution factor is regarded as non-relevant.

The final and decisive step is the generation of the so-called **Conflicts matrix.** Here is where a comparison is carried out between the Capacity to Tolerate Additional Pollution matrix (what additional impacts are justifiable) and the

Relevance matrix (relevant effects of the project, considering the initial pollution loads).

Table 1: Example of a conflict:

	Emissions to foreseeable environmental effects by				
	Air	Water	Soil	Waste	Other environmental pollution (e.g. waste heat)
Local protected interests					
People in settlement E: non-tolerable nuisance	↯				
Watercourse "model brook": Environmental quality, plant and animal life		↯			
Forest area: Environmental quality, plant and animal life					
Groundwater					
Air quality(ozone precursors)					
Soil					
.....					

In this example - an animal carcass utilization plant - conflicts with the local environmental situation resulted through odor nuisance and increase of the water temperature with synergy effect through nutrient enrichment. Special attention was paid in this case to the watercourse "model brook", since it was already polluted by the effluents of a paper mill. Through process modifications (the exhaust air, loaded with strong smelling substances, is used as combustion air for a firing installation; discharge of the waste water into the public sewerage system), these conflicts were resolved, whereby it was necessary to check whether new conflicts would result through the new measures.

7.5 The introduction of integrated permitting to Ireland

Dr. Ken Macken,
Environmental Protection Agency, Ireland

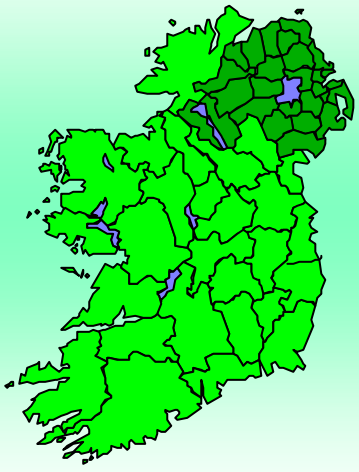
THE INTRODUCTION OF INTEGRATED PERMITTING TO IRELAND

An Overview

by

Dr. Ken Macken

Regulatory Authorities in Ireland



29	County Councils
49	Urban District Councils
5	Borough Corporations
5	County Borough Corporations
8	Regional Fisheries Boards
1	Department of the Marine
1	EPA

World Bank Workshop *Washington 1997*

Functions of the Agency

- Licensing and regulation of industrial and other processes with significant polluting potential on the basis of IPC and BATNEEC
- Monitoring of environmental quality
- Setting Environmental Quality Objectives and developing codes of practice
- Promoting and co-ordinating environmental research
- Promoting the use of environmental audits and establishing an Eco-labelling scheme
- Supervision of local authorities

Activities to be Licensed

- 1 Minerals *(4)*
- 2 Energy *(2)*
- 3 Metals *(9)*
- 4 Mineral Fibres, Glass *(4)*
- 5 Chemicals *(11)*
- 6 Intensive Agriculture *(2)*
- 7 Food and Drink *(7)*
- 8 Wood, paper, textile, leather *(6)*
- 9 Fossil Fuel *(4)*
- 10 Cement *(1)*
- 11 Waste *(4)*
- 12 Surface Coating *(3)*
- 13 Other activities *(4)*

61 Categories
~800 activities

Aims of IPC

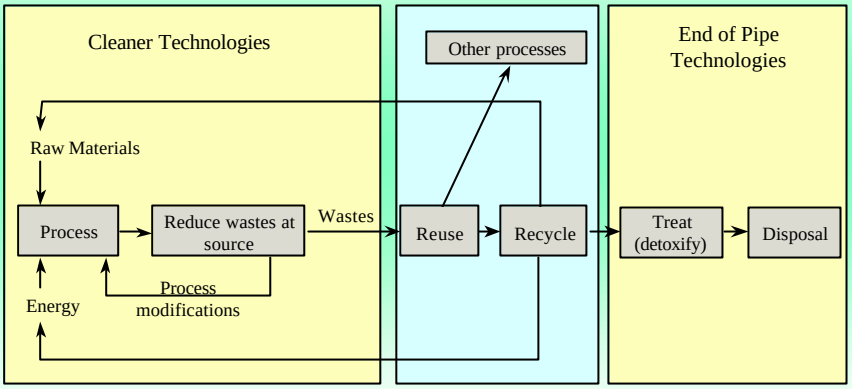
- prevent pollution at source
- minimise releases to the environment
- apply *BATNEEC principle*

Agency's Approach

- Process design/redesign to eliminate emissions
- Substitution of materials/solvents
- Waste minimisation by process control, inventory control and end-of-pipe technology

- Onus is on the developer or operator to demonstrate that in selecting a process all avenues for **elimination** and **substitution** have been examined and any appropriate measures adopted

Hierarchy of Pollution Control



GUIDANCE ON BATNEEC

- BATNEEC Guidance Notes
  - Sectoral Notes (55 of 61 sectors)
- Noise Note
- EIS Note

However, it is also generally envisaged that ***existing facilities*** will progress towards attainment of similar emission limit values to those for new facilities, but the specific ELV requirements and associated time frames will be identified on a case by case basis when the licence application is being processed.

Furthermore, for ***all facilities***, additional and more stringent requirements may be specified on a site-specific basis whenever environmental protection so requires. Hence the BATNEEC guidelines are not the sole basis on which licence emission limit values are to be set since information from other sources will also be considered including site-specific environmental and technical data, plant financial data and other relevant information.

IPC to Date

Applications		550
– Licenses issued	424	
– Refused/withdrawn/abandoned	30	
– Proposed Determinations	22	
– Under consideration	74	
Licenses Objected to		
– First party objections	221	
– Third party objections	107	
Oral Hearings		2

Condition 2
Management of the Activity

2.1 The licensee shall establish and maintain an Environmental Management System (EMS) which shall fulfil the requirements of this licence. The EMS shall include as a minimum those elements specified in the Conditions 2.2 to 2.9 below.

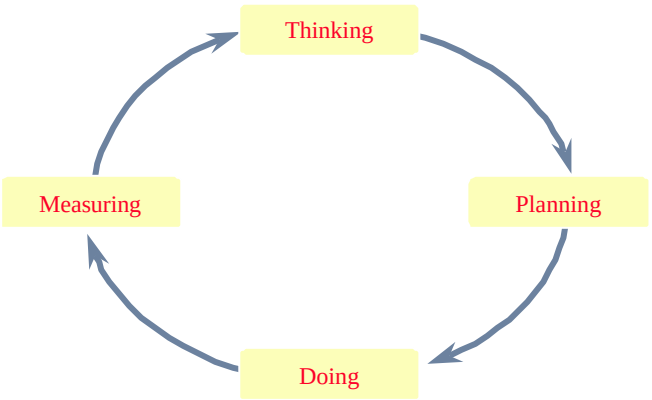
Conditions 2.2 to 2.9

2.2 Objectives and Targets
2.3 Environmental Management Programme (EMP)
2.4 Pollution Emission Register (PER)
2.5 Documentation
2.6 Corrective action
2.7 Awareness and Training
2.8 Responsibilities
2.9 Communications

The Benefit of an EMS

- Structured environmental management tool
- Allows for the preparation and implementation of environmental programmes
- Reduction in emissions
- Waste minimisation
- Improved environmental control

The Improvement Loop



EPA Enforcement Post Licence

- Check for compliance with licence requirements.
- Check on quality of monitoring by the licensee.
- Check for incidents reported/unreported releases
- Audit and direct programmes of environmental improvement.
- Assess the quality of the receiving environment.

Enforcement - Monitoring

	1996	***1997***	***1998***
• Monitoring visits by the Agency	504	889	1,244
• Samples analysed by the Agency	1,272	1,909	2,095
• Total no. of analyses by the Agency	24,139	36,405	36,504
• Audits	21	60	102
• Inspector's site visits	329	490	642

Financing

- Application Fees
  - Range €3,200 - €23,000
  - Average Fee €7,000
- Enforcement Fees
  - Average in 1998 was €5,000

Charges

- Processing Returns
  - Annual Environmental Report
  - Routine Self-Monitoring Reports
  - Once-off Reports
- Site Visits
  - Typically 1-2 per year
- Audits
  - Typically 0.5 - 1 per year
- Agency Monitoring
  - (Travel costs, time and analysis)

7.6 The German Approach to the Use of BREFs at the National Level

Dr. Michael Lange,
Federal Environmental Agency, Germany

presented by

Dr. Jürgen Landgrebe,
Federal Environmental Agency, Germany

Introduction

Having overcome some initial difficulties, the Sevilla process for the elaboration of BAT Reference Documents (BREFs) for the exchange of information pursuant to Article 16 (2) of the IPPC Directive is now well underway. Some ups and downs have been experienced in compiling the best available techniques (BAT) for the various industrial sectors. We, on the German side, would like to mention that tasks that continue to be particularly important and urgent include, for example, the harmonisation of measuring and data interpretation methods; we therefore attach great importance to the speedy elaboration of the horizontal BREF on Monitoring.

In view of the problems that had to be solved, the first completed BREFs, "Iron and Steel" and "Cement and Lime", as well as the "Pulp and Paper" and "Non-Ferrous Metals" BREFs about to be finalised should, overall, be rated as qualified documents and as a good, transparent basis for the emission and consumption levels that have been derived from BAT. In Germany, the results of the BREFs are intended to be utilised primarily for further developing and establishing national standards in the fields of air quality control, water protection, waste prevention and recovery, and rational and efficient use of raw materials and energy, with the main focus on national emission standards for air pollutants and for discharges of waste water into waters.

Legislation currently in force

A long-established practice in Germany for industrial plants that are of particular environmental relevance is that they are licensed in a procedure involving public participation. Emission control requirements for air quality control and noise abatement purposes as well as requirements on waste prevention and recovery and, in some cases, on heat utilisation are imposed above all in the licensing procedure under the Federal Immission Control Act (BImSchG). The requirements are based on the state of the art in emission abatement. Upon expiry of a defined transitional period, existing plants must conform to the state of the art – or else be decommissioned.

Requirements for the discharge of waste water into waters are also based on the state of the art. Minimum requirements reflecting the state of the art, as provided for in Article 7a of the Federal Water Act (WHG), are developed at the federal level. They are subsequently implemented by the competent permitting authorities of the Federal States when drawing up decisions pursuant to water legislation provisions (permits). In so doing, more stringent requirements may be imposed in observance of water quality.

National emission standards for air pollutants are laid down in statutory ordinances under the Federal Immission Control Act for specific types of installations and, for the majority of installations subject to licensing, in the Technical Instructions on Air Quality Control (TA Luft). In deriving emission standards and emission limit values for inclusion in the TA Luft, cross-media

aspects were taken into account from the very start, in particular in order to prevent problems being shifted from the air to other environmental compartments or to keep such shifts to a minimum. Economic aspects were always taken into account by evaluating the proportionality of the costs of the necessary measures.

A corresponding procedure is used for the establishment of emissions standards in the waste water ordinances under the Federal Water Act and for permitting by the water authorities on the basis of these.

The Planned Environmental Code

In Germany, the laws regulating the licensing of installations and the body of implementing regulations have to be further developed to bring them into line with Community legislation, notably the IPPC Directive. The Federal Government is planning a conceptual restructuring of the entire body of environmental laws, through a new Environmental Code. All central environmental regulations issued at federal level to regulate the permitting of installations are to be harmonised and consolidated into this Environmental Code, using an integrated approach. Originally, it was planned to take the implementation of the IPPC Directive and other directives as an occasion to begin compiling the Environmental Code. However, as the Federation's law-making powers are restricted – in the water field, it may only enact framework legislation – this has not been possible to realise in the short term. Implementation is now planned to occur in the framework of the existing specialised laws.

Amendment of existing statutory regulations and supplementary provisions

Implementation – mainly, of the amended EIA Directive and the IPPC Directive – through the various specialised laws will involve the amendment of several laws. The laws planned to be adapted to the provisions of the IPPC Directive comprise, in particular, the Federal Immission Control Act (BImSchG), the Federal Water Act (WHG) and the Act on Closed Substance Cycle Waste Management and Waste Disposal (KrW-/AbfG). This ensures a complete coordination of the licensing procedure for installations covered by the IPPC Directive. Cross-media aspects will be taken into account when establishing limit values for emissions to air and water; these emission limit values will be based on the state of the art (corresponds in large part to best available techniques) and designed to ensure a high level of protection of the environment as a whole.

The central elements of the amendment will concern changes to the Federal Immission Control Act and to major ordinances enacted for its implementation: The licensing procedure with public participation provided for under the

BImSchG is to be extended to embody the IPPC Directive's integrated approach. Related to the BImSchG, this can be achieved by:

?? redesignating the Act's purpose: For installations subject to licensing, the act would serve the integrated prevention and control of harmful effects on the environment caused by emissions to air, water and soil, with consideration given to waste management, in order to achieve a high level of protection of the environment as a whole;

?? adapting the concept of state of the art: The definition is to be extended to explicitly include cross-media aspects by calling for measures to limit emissions to air, water and soil; when determining the state of the art, consideration is to be given to the criteria specified in Annex IV to the IPPC Directive. The definition of state of the art will, in identical form, be incorporated into the Federal Immission Control Act, the Federal Water Act and the Act on Closed Substance Cycle Waste Management and Waste Disposal.

?? the operator's obligation to use raw materials and energy efficiently: The heat utilisation obligation hitherto applicable will be extended to include the requirement that installations subject to licensing be established and operated in such a way that raw materials and energy are used efficiently;

?? the complete coordination of the procedure: The licensing authority (under the BImSchG) will be responsible for assuring a complete coordination of the licensing procedure and of the conditions imposed. Licenses or permits pursuant to water legislation provisions will be issued by the competent authorities of the Federal States – in the framework of coordination by the BImSchG authorities.

Further amendments concern, in particular, the Fourth Immission Control Ordinance (4. BImSchV) and the Ninth Immission Control Ordinance (9. BImSchV), two ordinances for the implementation of the BImSchG:

?? Amendment of 4. BImSchV (Ordinance on Installations Subject to Licensing): The catalogue of installations subject to licensing will be expanded in observance of Annex I to the IPPC Directive and the provisions of the amended EIA Directive.

?? Amendment of 9. BImSchV (Ordinance concerning the Licensing Procedure): The obligations to be fulfilled by the operator will be supplemented and further specified, e.g. with regard to the information to be provided about planned measures to achieve an economical and efficient use of energy.

Amendment of regulations implementing national legislation and use of the BREFs

Supplementing the planned amendment of several laws and ordinances, it is planned to make important amendments to further regulations implementing national legislation. For subsequent amendments, information from the BREFs will directly be taken into account in the establishment of national emission standards.

In line with the well-tried approach hitherto utilised in Germany, i.e. establishment of national emission standards for air pollutants and waste water discharges, general and uniformly applicable emission limit values for installations subject to licensing and for waste water discharges will be laid down in regulations implementing national legislation. In this way it is ensured that the precautionary principle of reducing emissions in keeping with the state of the art is enforced and, simultaneously, that licensing procedures are carried out uniformly and equally throughout Germany. When deriving and establishing emission limit values, cross-media and cost aspects will be taken into account from the outset.

At the local level, the BREFs may be used as additional sources of information for the formulation of licensing requirements, whereby the national emission standards must not be weakened.

Example: Revision of the TA Luft

The Technical Instructions on Air Quality Control (German acronym: TA Luft) are a general administrative regulation containing *inter alia* requirements intended as a precaution against harmful effects on the environment due to air pollutants. It has to be applied in the licensing of new installations as well as in the licensing of essential alterations to and the rehabilitation of existing installations. The TA Luft is currently being subjected to a comprehensive revision. This revision also includes the further development of the emission standards for a very large number of installations subject to licensing. The new emission standards are being derived and established in keeping with the state of the art – without prescribing a particular technology.

Where BREFs are available for given industrial sectors prior to issue of the revised TA Luft, the information they contain will be taken into account in the derivation and establishment of emission control requirements.

The following procedure is envisaged to be applied where new or revised BREFs are published by the European Commission after the issue of the revised TA Luft: An advisory committee composed of experts representing the parties concerned, which is to be convened by the Federal Ministry for the Environment, will examine the extent to which the information contained in the BREFs gives rise to emission control requirements that are farther-reaching than or supplement those laid down in the revised TA Luft. The committee is to give its opinion as to areas in which the state of the art has progressed as compared to the provisions of the revised TA Luft or in which the provisions of the TA Luft

need to be supplemented. When the Federal Ministry for the Environment gives public notice of the further development of the state of the art or of a necessary addition in the Joint Ministerial Gazette, based on a defined and transparent procedure, this will lift the revised TA Luft's nature as a regulation binding on the licensing and supervisory authorities for the requirement in question, and the authorities may directly take the new or supplemented state of the art into consideration.

In addition, the revised TA Luft is to include a general section with general provisions requiring preferential use of production-integrated techniques and the consideration of cross-media aspects. These general requirements may be put into more concrete terms in particular in the discussions provided for by the BImSchG between the operator and the authority in the planning and prior to the establishment of an installation. In this context, the BREFs can be used as sources of information in the establishment and specification of emission control requirements.

Example: Amendment of Annexes to the Waste Water Ordinance

Embodying the term "public interest", Article 6 of the Federal Water Act (WHG) is the central provision for determining whether to grant a permit or license for the discharge of waste water. This term entails the obligation to adopt a comprehensive, cross-media view which takes into account all water resources management considerations that may be affected by the use of a water body, but also extends to other concerns, and requires a complex weighing between and balancing of different interests.

Discharges of waste water pursuant to Article 7 a WHG are subject to the application of the state of the art. This includes the minimization of the pollutant load. With a view to evaluating the extent to which the integrated approach of the IPPC Directive and of the amending legislation is integrated into the water pollution control regulations issued under the Federal Water Act, the Ordinance on Requirements for the Discharge of Waste Water into Waters (Waste Water Ordinance), of 21 March 1997, with what are now 43 sector-specific annexes deserves particular mention. The requirements of this Ordinance already reflect the integrated approach of the IPPC Directive, adopted in 1996; Article 3 para. 2 of the Ordinance provides:

> *"The requirements of this Ordinance must not be met by means of procedures in which environmental pollution is transferred to other environmental media such as air or soil, contrary to the state of the art."*

This means that any shifting to other environmental media has to be avoided by making full use of the available technical and organisational means.

The sector-specific annexes of the Waste Water Ordinance are reviewed on a regular basis by groups of experts for the extent to which the state of the art in emission abatement and control has progressed and the requirements of the Waste Water Ordinance need to be updated. These reviews also include the examination of the best available techniques identified in the BREFs.

Summary and outlook

In Germany, cross-media aspects have already in the past been taken into account in the establishment of emission limit values for air pollutants and for discharges of waste water into waters. A progressive state of the art is applied to new installations as well as – subject to granting of transitional periods – to existing installations. Costs are taken into account by evaluating whether they are proportional to the emission reductions achieved. The planned amendments to statutory environmental protection regulations are designed to achieve the following:

- A complete coordination of the authorisation procedure by the licensing authority under the Federal Immission Control Act – in order to achieve a high level of protection of the environment as a whole.
- The application of the state of the art. Integrated national emission control requirements will be established for air pollutants and for discharges of waste water.
- Use of available BREFs as important sources of information in the derivation and establishment of national emission standards; in addition, in the individual case the BREFs may provide important information for use in the planning and establishment of an installation or in the rehabilitation of an existing installation.
- The consideration of information contained in new or updated future BREFs in the further development of national emission standards in a transparent review process, with the participation of governmental authorities and industrial and environmental associations.

As National Focal Point, the Federal Environmental Agency will continue to actively participate in the elaboration of the BREFs with a high level of commitment. Together with authorities at *Land* level and other institutions, it will make operating, emission and consumption data as reliable as possible from modern plants in Germany available as input to the Sevilla process. The goal is to produce ambitious BREFs in order to ensure that a high level of protection of the environment is achieved in Germany and in the other Member States of the European Union by the Europe-wide use of the best available techniques described therein.

7.7 Swedish experience of integrated permit procedures

Erik Nyström,
Swedish Environmental Protection Agency

Summary

The Swedish system for environment protection at large point sources might be characterised as follows:

?? One individual, integrated permit procedure

?? Self-monitoring of emissions and the local environment

?? Monthly and annual reports sent by the plants to the responsible authority

?? Annual audits by external experts

?? Compliance checking by the authorities

?? Sanctions and charges for non-compliance

?? Openness to the public

The system requires, or perhaps rather promotes:

?? That there are highly qualified people both within industry and authorities

?? That both industry and authorities know what BAT is for the sector in question

?? That industry takes its responsibility, e.g. by seeing to it that environmental issues are an integrated part of the overall management of the plant

?? That preventive, in-process, measures are preferred to end-of-pipe solutions

?? That there is an openness and mutual trust among the different stakeholders. It should be noted, however, that they have distinct roles to play

?? That there is an exchange of experience between monitoring and permitting

During its 30 years of existence the system has resulted in a drastic reduction of emissions from large point sources without reducing the competitiveness of industry.

The BREFs are expected to play an important role in future work with IPPC-installations in Sweden given that BAT in the BREFs will reflect the most effective and advanced stage in the development of activities within the sector.

Introduction

Swedish environmental policy is characterised by comprehensive administrative regulation, with far reaching powers accorded to the authorities. For point sources Sweden has had a system of integrated pollution prevention and control since 1969 by virtue of the Swedish Environmental Protection Act.

The integrated approach in the Act is characterised by the fact that the same licensing authority assesses practically all the potential environmental impacts of a planned installation on the same occasion. This makes it possible to address potential cross-media conflicts.

The licensing authority is faced with a complex task both from a legal and technical point of view. The system therefore requires independent and highly qualified licensing authorities.

The licensing authority for large point sources ("Class A installations") was until 1 January 1999 a centralised independent body, The Licensing Board, made up of five different units. Today there are five decentralised environmental courts with similar ways of working. The total number of Class A installations is between 300 and 400.

The Swedish EPA is the central authority responsible for environmental matters but is not a licensing authority.

There are 21 regional state authorities, the County Administrative Boards. Within each of these there is one section for environment protection in general. There is also one independent licensing authority for medium-sized enterprises ("Class B installations") of which there are about 7 000. The County Administrative Boards are responsible for the surveillance of both Class A and Class B installations.

Moreover, there is one local Health and Environmental Board within each of the 300 or so Swedish municipalities. Small enterprises ("Class C installations") have to notify their planned activities to these boards and are also surveyed by them.

A government ordinance lists which installations belong to each of the three different classes.

Although Sweden now has a new environmental code since 1 January 1999, the system for permitting and surveillance of industrial installations is quite similar in many respects. The adoption of the Code meant however among other things that the IPPC-directive was brought into effect.

Of the around 700 installations falling under the IPPC-directive, about 200 are Class A installations and 500 Class B. Of these 500 about 300 are landfills, 100 are animal farms, and 100 are other activities.

Permit Procedures

The permit procedure is triggered by new plant construction, plant expansions, or alterations of the process that may affect the environment.

In order to obtain a permit, applicants should present an Environment Impact Assessment (EIA) and provide details regarding the situation today and proposals for the future:

- Why the site chosen on balance is the best.
- Transport to and from the site
- Consumption of raw material, energy and process chemicals
- Production processes

- Internal and end-of pipe measures, their effectiveness, cross-media effects if any, and costs.
- Environmental releases from the process to all media
- Generation and disposal of waste
- Landfill at the site
- Ambient noise and counter-measures

Before sending in an application the operator has to inform the County Administrative Board, other authorities concerned, and people living close by the intended project. There will also be a dialogue concerning which measures could and should be taken. Moreover, advice will be given to the applicant-to-be on what should be included in the application for a permit and in the Environment Impact Assessment. The usefulness of this dialogue is very much dependent on the authorities having good knowledge not only in legal and environmental matters but also in industrial processes. The EIA is a separate document, which will be assessed and approved.

Decisions are taken on a case-by-case basis integrated for all media. Under the code, the use of resources like energy and transport requirements will also be taken into account.

The process of obtaining a permit

After having received an application, the court can ask the EPA, the County Administrative Board and the local environment body if they need additional information from the applicant. Quite often the applicants are asked to give information on what could be done in addition to what they propose, e.g. by applying Best Available Techniques for the sector, and the economic and environmental consequences of doing so.

When such information has been added, the public is made aware of the existence of the application by advertisements normally in two local newspapers. Authorities and the public are then asked or invited to submit written statements to the court. The statements are to spell out what is considered an appropriate level of measures and why.

A public hearing and an inspection of the site precedes the decision. A decision by the court can be appealed against to the Environmental Court of Appeal while a decision by the former Licensing Board was appealed against to the government.

The courts

The court, like the former Licensing Board, is made up of four people. Each application from a company is heard in the court by four judges; one judicial judge, one with technical or scientific education and experienced in environment protection, and two layman judges, one an industrialist and one a person experienced in matters handled by the EPA.

If the application is accepted, the decision by the court states what the maximum permitted production is and under which conditions. The four people of the court base the conditions for the permit on their joint expert judgement. This means finding the proper balance between different media taking into account costs, effectiveness and the recipient. The reasoning behind the decision is given. It could be noted that the IPPC-directive explicitly states that in all circumstances, provisions for the minimisation of long-distance or transboundary emissions shall be included.

During the 1990´s there were about 220 large and small applications from Class A installations handled by the Licensing Board each year. It also decided on about 250 appeals concering decisions for Class B installations. The Board had about 30 employees out of whom 15 were professional staff and 15 administrative personnel. The industrialist and the person having knowledge in EPA matters were brought in for up to a week for every application. There was a pool of some twenty such experts to choose from. The total budget for the Board was about 2 MEURO per year.

The time needed for EPA staff to issue statements varies of course depending on the type of application. For large applications, it can be up to four weeks but is normally less. During recent years, EPA officers have spent about 200 weeks per year on about 60 Class A applications. The Agency does normally not involve itself in Class B applications.

The time spent by officers from the County Administrative Boards on applications from major activities is about one week per application and probably about the same for the local environment and health boards.

The County Administrative Boards decide on about 1000 Class B applications annually spending about two weeks on each.

Conditions in the permit

The use of “Best Possible Techniques”, as said in the Code, is a key consideration when deciding on conditions. This is in principle the best techniques used on a commercial scale at similar plants anywhere in the world. This resembles the definition used in the IPPC-directive for Best Available Techniques, BAT, in a general sense.

Commercial operations must apply “Best Possible Techniques” to avoid damage unless it is regarded as unreasonable to do so. When making this assessment, the benefit of the precautionary measure is to be compared with the expense of applying it. The final decision on what measures should be taken can be regarded as what the IPPC-directive calls BAT “in specific cases”. For existing activities, a certain transitional period is sometimes required for the introduction of equipment corresponding to what is considered to represent BAT.

In a permit, it is also possible to grant a trial period under which the applicant investigates the best ways of reducing emissions e.g. by comparing the effectiveness of available internal and external measures or by developing

new, normally internal, measures. Such trial periods are normally carried out in consultation with the Swedish EPA and the County Administrative Boards in question.

Preference is given to the use of in-plant measures as opposed to end-of-pipe treatment. It is recognised that in-plant measures might result in higher concentrations but lower absolute emissions to and from any subsequent treatment plant. The amount of pollutants, e.g. tonnes/year, is normally regarded to be decisive rather than the concentration.

Conditions are consequently often set as amount per day, monthly or annual averages and sometimes also in kg/tonne of production. They do however rarely include limit values as concentrations, e.g. in mg/l water or mg/m3 of gas.

The BREFs, when published, are likely to assist Swedish industry and authorities when discussing what "Best Possible Techniques" is for the sector in question. As long as the BREFs give information on which techniques are most effective in achieving a high level of protection for the environment as a whole, they have the potential to contribute to the prevention, reduction, and as far as possible elimination of pollution from large point sources. On the other hand, if BAT in the BREFs is less effective than achieved by the best installations, there is a risk that the BREFs will not, as intended, serve as a driver towards improved environmental performance across the European Community.

Minimum performance standards

Sweden has, so far, issued only a few regulations imposing minimum environmental performance standards for industrial activities, mainly as a consequence of EU-directives. Individual measures have enabled technical development to be rapidly exploited and introduced and cost-effective measures to be taken. It might, however, in the future be useful to have minimum standards, in particular for sectors with many smaller installations and where the technology can be regarded as mature.

The Swedish EPA has, however, issued a number of fact sheets on medium-sized installations. These fact sheets are thus mainly for installations permitted by the County Administrative Boards. The fact sheets normally describe processes, environment impacts, and possible remedial measures. Moreover, they propose the conditions that might be considered. The EPA has also issued reports on what it regards as BAT for certain large industrial installations.

Results from 30 years of integrated permit procedures

Generally speaking, emissions from industry have been reduced by about 90% between 1969 and 1999. During the same period production increased considerably.

Enforcement

Enforcement should be seen as an integrated part of the system for environmental protection. One reason being that experience from e.g. monitoring and inspections can play an important role when statements are issued and conditions proposed for new applications.

Monitoring of emissions

The operator of an activity shall continually plan and monitor the activity in order to prevent damage and nuisance; so-called self-monitoring. Monitoring requirements are specified in a programme set by the County Administrative Boards on a proposal from the operator. The company conducts its own sampling and analyses if accredited to do so or sends the samples to an outside laboratory.

Results are submitted monthly to the County Administrative Board. For larger installations, an independent consultant each year checks monitoring procedures, takes audit samples, assesses compliance with permit requirements and gives advice on what should be improved. The County Administrative Board normally visits larger installations at least once a year. The companies are to send by 1 April every year an Annual Environment Report to the Board. The results are made available to the public.

The supervision will, as a main principle, be financed by charges.

Monitoring the impact on the environment

The operator's legislative obligation to carry out monitoring of the plant includes an obligation to monitor the activity's impact on the local environment, below called “surveillance monitoring”. The operator of an activity must, according to the Polluter Pays Principle (PPP), bear the costs for monitoring the environmental impacts that can be to associated with the activity's emissions.

Surveillance monitoring may concern surface water, groundwater, air, or soil. The EPA has issued general guidelines for surveillance monitoring of surface water.

The aim of the surveillance monitoring is to show the emissions' environmental impact in terms of effects. It will also give information about the load on the environment and the dispersal of that load in a specific area. Moreover, it is intended to relate the environmental situation to the expected background level and to provide a foundation for assessment of precautionary measures needed.

Several small and large installations may have an impact on the actual environmental situation and have an interest to monitor it. They often find it cost-effective to form associations for joint monitoring. Such co-ordinated surveillance monitoring programmes are today the dominant forms of monitoring. These types of programmes are intended to be a part of the

national environmental monitoring systems. Costs that cannot be directly linked to a single activity, are split between the members of the associations

Information from surveillance monitoring programmes is used in the permit procedure, i.a. in the Environment Impact Assessment.

Sanctions

If a County Administrative Board suspects an offence, e.g. that a condition in a permit has been violated, the public prosecutor must be informed. The suspicion can emanate from a visit to the site or from the monthly or annual reports sent in by the operator. The police will, in co-operation with the public prosecutor, investigate suspected offences. A sentence shall be imposed by a general court of law when someone intentionally or by carelessness violates a condition. A violator can be sentenced to a fine or, in more severe cases, to jail.

In addition to sentences, an environmental sanction charge can be imposed for various kinds of violations. This charge shall be imposed even if the violation has not occurred intentionally or by carelessness. The charge does not prevent the imposition of a penalty for a criminal act. The charge may be from 5 000 to 1 million Swedish kronor. Starting a new activity without a permit can eg. cost 600 000 kronor while not sending in an annual report within the deadline given can cost 5 000 kronor.

List of Participants

Country/ Organization	Name	Address
AAC	Squarci, Lorenza	AAC Brussels
Austria	Biladt, Albert	Magistrat der Landeshauptstadt Linz Amt für Natur und Umweltschutz Linz
Austria	Donninger, Rudolf Dr	Wirtschaftskammer Österreich Vienna
Austria	Goeller, Rudolf	Bundesministerium für wirtschaftliche Angelegenheiten Vienna
Austria	Gründling, Christian	Fachverband der chemischen Industrie Österreichs - FCIO Vienna
Austria	Lauber, Wolfgang Dr	Bundesarbeitskammer Abt. Umwelt und Verkehr Vienna
Austria	Reiter, Barbara Dr	Bundesministerium für Umwelt, Jugend und Familie Vienna
Austria	Schaubschläger, Otto-Werner	Magistrat der Landeshauptstadt Linz Amt für Natur und Umweltschutz Linz
Austria	Schindler, Ilse	Umweltbundesamt Vienna
Belgium	Boucneau, Michel	VMM Erembodegem
Belgium	Huau, Georges	Aminal Leuven
Belgium	Lamote, Erwin	AMYLUM Belgium N.V. Aalst
Belgium	Cornet, Jacques	DGRNE/DPA Namur (Jambes)
Belgium	de Meyer, Geert	Vito Mol
Belgium	Dijkmans, Roger	Vito, BAT centre Mol
Belgium	Schliessner, Ursula	Oppenheimer Wolff & Donnelly LLP Brussels
Belgium	van Bouwel, Eddy H.	Exxon Chemical Europe, Inc. Machelen
Belgium	van Steen, Jaak	BASF Antwerpen N.V. Antwerpen
Belgium	Vlasselaer, Diane	Vlaamse Milieumaatschappij Leuven
Bulgaria	Kostov, Angel	Ministry of Environment and Water Sofia BULGARIA
Bulgaria	Radev, Peter	Borrowed Nature Sofia

Country/ Organization	Name	Address
Bulgaria	Tonchevski, Anthony	Centre for Environmental Information and Education Sofia
CEC	Ehrenberg, Joachim Dr	CEC Brussels
CEFIC	Doktor, Frantisek	CEFIC Brussels
CEFIC	Hezel, Carl Dr	VCI/CEFIC Frankenthal
CEFIC	Mongenet, François	CEFIC Brussels
CPIV	Maeyaert, Gilbert	CPIV Brussels
CPIV	Tackels, Guy	CPIV Aubervilliers, Cédex
CEN	Perez Guevara, Marisol	CEN/CMC Brussels
CONCAWE	Schipper, Henk	CONCAWE Brüssels
Cyprus	Malikkides, Christos	Factory Inspectorate Nicosia
Cyprus	Nicolaides, Leandros	Factory Inspectorate Nicosia
Czech Republic	Baranek, Petr	Nová Hu, a.s. Ostrava-Kuncice
Czech Republic	Christianová, Anna	Cleaner Production Centre Prague 2
Czech Republic	Dlouhý, Jirí	TECHEM Ltd. Prague
Czech Republic	Jungwiertová, Vladimíra	Steel Federation, Inc. Prague
Czech Republic	Karták, Jan	CITYPLAN Ltd. Prague
Czech Republic	Litera, Otakar	Trinecke zelezarny a.s. Trinec
Czech Republic	Maxa, Tomás	TECHEM Ltd. Prague
Czech Republic	Moucha, Bohuslav	Czech Environment Management Center Prague
Czech Republic	Pribylova, Monika	Ministry of the Environment Prague
Czech Republic	Suchanek, Zdenek	DHVCR, Ltd. Prague
Czech Republic	Zíka, Ivan	Verband der Chemischen Industrie der Tschechischen Republik Prague
Denmark	Andreasen, Preben	Aalborg Portland Aalborg
Denmark	Friis, Jörgen	Department of Environmental And Land Use Management Odense

Country/ Organization	Name	Address
Denmark	Husballe, Berit	Frederiksborg County Hillerød
Denmark	Jensen, Arne	Dansk Metal Kopenhagen
Denmark	Källstrøm, Hans-Henrik	Frederiksborg County Hillerød
Denmark	Mogensen, Ole	Aalborg Portland Aalborg
Denmark	Møller, Marina Snowman	Carl Bro a/s Glostrup
Denmark	Neergaard, Beate	County of Stoerstroem Nykøbing
Denmark	Thomsen, Erik	Danish EPA Copenhagen
EEB	Hey, Christian Dr	European Environmental Bureau (EEB) Brussels
EEB	Silina, Mara	European Environmental Bureau (EEB) Brussels
EIPPCB	Finkeldei, Ludwig	EIPPCB IPTS - European Commission Sevilla SPAIN
EIPPCB	Hagström, Petra	EIPPCB IPTS - European Commission Sevilla, Spain
EIPPCB	Jansen, Ineke	EIPPCB IPTS - European Commission Sevilla, Spain
EIPPCB	Litten, Don	EIPPCB IPTS - European Commission Sevilla, Spain
EIPPCB	Radway, Alex	EIPPCB IPTS - European Commission Sevilla, Spain
EIPPCB	Sørup, Per Dr	EIPPCB IPTS - European Commission Sevilla, Spain
Estonia	Randmer, Anne	Center for Development Programs EMI-ECO Tallinn ESTONIA
Estonia	Ruut, Juhan	Estonian Green Movement FOE Estonia Tartu
Estonia	Tapner, Galina	Kunda Nordic Tsement Kunda
Estonia	Truusa, Juri	Ministry of Environment / IPPC Tallinn
Estonia	Viisimaa, Matti	Estonian Ministry of Environment Waste Department Tallinn

Country/ Organization	Name	Address
EUROFER	Herlitz, Hans	European Confederation of Iron and Steel Industries (EUROFER) Brussels
European Commission	Aichinger, Herbert	European Commission DG Environment Brussels
European Commission	Frommer, Ruth	European Commission DG Environment Brussels
European Commission	Gislev, Magnus	European Commission DG Environment Brussels
European Commission	Lopatta, Hans	European Commission DG Environment Brussels
European General Galvanizers Association	Marberg, D.	European General Galvanizers Association c/o Institut Feuerverzinken Düsseldorf
Finland	Kaivos, Pirjo	Metso Corporation Helsinki
Finland	Ruonala, Seppo	Finnish Environment Institute Helsinki
Finland	Voutilainen, Pia	Outokumpu Copper Products Pori
France	Bartaire, Jean-Guy	EDF Saint-Denis, Cédex
France	Basset, Jean Michel	SCHNEIDER ELECTRIC Grenoble
France	Bouchereau, Jean Marie	Programme Industrie & Environnement Institut Français de l'Environnement Orléans
France	Brignon, Jean-Marc	Institut National de l'Environnement Industriel et des Risques (INERIS) Verneuil-en-Halatte
France	Clavel, Bernard	Ministère de l'Agriculture Paris
France	Clemente, Colette	Ministère de l'Aménagement du Territoire et de l'Environnement Segur
France	Guion, Philippe	EUROLYSINE Company Paris
France	Laffont, Paul	Saint Gobain Vitrage La Défense
France	Latrobe, Bertrand	ROQUETTE / A.A.C. Lestrem
France	Lucas, Philippe	Ministère de l'Aménagement du Territoire et de l'Envionnement Service de l'environnement industriel Paris

Country/ Organization	Name	Address
France	Mikailoff, Nicolas	Gaz de France Direction Commerciale Paris
France	Rogier, Philippe	Bureau de l'orientation économique et de l'environnement des entreprises Sous-direction de la valorisation et de l'organisation des filières Service des stratégies agricoles et industrielles Direction des politiques économique et internationale Ministère de l'agriculture et de la pêche Paris
France	Vicard, Jean-François Prof.	STRATENE Lyon
Germany	Albrecht, Wigbert	Landesamt für Umweltschutz Sachsen-Anhalt Halle
Germany	Asmussen, Silke	ATV – DVWK Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall i.G. Hennef
Germany	Aßmann, Carola	Ministerium für Landwirtschaft, Umweltschutz und Raumordnung Abt. Immissionsschutz Potsdam
Germany	Augustin, Michael	Regierungspräsidium Kassel Staatliches Umweltamt Bad Hersfeld Bad Hersfeld
Germany	Bachmann, Jürgen	DEKRA Umwelt GmbH Stuttgart
Germany	Baer, Stefani	Ecologic Berlin
Germany	Bäuerle, Raimund	Regierung von Schwaben Augsburg
Germany	Bastigkeit, Annette	Beratungs- und Service- Gesellschaft Umwelt mbH Berlin
Germany	Baumann, Heinrich	Regierung der Oberpfalz Regensburg
Germany	Baumann, Wolfgang	Baumann Krüger Eiding Rechtsanwälte Würzburg
Germany	Becker, Bernd Prof. Dr	Universität der Bundeswehr München Munich
Germany	Beier, Maike	Institut für Siedlungswasserwirtschaft und Abfalltechnik der Universität Hannover Hannover
Germany	Benz, Ernst	Staatliches Gewerbeaufsichtsamt Villigen-Schwenningen Amt für Arbeits- und Immissionsschutz Villingen-Schwenningen
Germany	Bergmann, Uwe	Institut für Ökologie und Unternehmensführung Oestrich-Winkel

Country/ Organization	Name	Address
Germany	Bertsch, Rainer	Kusterdingen
Germany	Berzel, Klaus	Verband der Baden-Württembergischen Textilindustrie e.V. Stuttgart
Germany	Beyer, Karl	Ingenieurbüro Beyer Nürnberg
Germany	Beyl, Rüdiger	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Bilz, Wolfgang	Regierungspräsidium Kassel Staatliches Umweltamt Bad Hersfeld Bad Hersfeld
Germany	Birle, Hans	Verband Deutscher Maschinen- und Anlagenbau e.V. (VDMA) Wasser- und Abwassertechnik Frankfurt/Main
Germany	Blaschke, Günter Dr	VCI Landesverband Bayern Munich
Germany	Blattner, Bruno	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Bohley, Ursula	Regierungspräsidium Stuttgart Abteilung 5, Referat 53 Stuttgart
Germany	Bollmann, Werner	TÜV Süddeutschland Bau und Betrieb GmbH Karlsruhe
Germany	Bolwerk, Richard	Bezirksregierung Münster Dezernat 56 – Immissionsschutz Münster
Germany	Borchardt, Anke	Verband der Chemischen Industrie e.V. Frankfurt/Main
Germany	Bradke, Harald	FHG - ISI Karlsruhe
Germany	Bracht, Alexander	Hessische Technologiestiftung GmbH Wiesbaden
Germany	Brandrup, Johannes Dr	APME Wiesbaden
Germany	Braunmiller, Michael	Regierungspräsidium Stuttgart Stuttgart
Germany	Bredereck, Eberhard	Verband der Chemischen Industrie e.V. Technik und Umwelt, Wasser und Abfall Frankfurt/Main
Germany	Brunner, Peter	Gewerbeaufsichtsamt Stuttgart Stuttgart
Germany	Büsgen, Uwe	Ecologic Berlin
Germany	Burckhard, Ulrich	Staatliches Gewerbeaufsichtsamt Sigmaringen Stuttgart
Germany	Busch, Reinhard	Nordmilch eG Ovelgönne

Country/ Organization	Name	Address
Germany	Calliess, Gunter	Bundesministerium für Wirtschaft und Technologie, Referat IV C 1 Berlin
Germany	Cmelka, Dieter	Deutsche Unilever Gruppe Hamburg
Germany	Coldewey, Ines	Verband der Deutschen Milchwirtschaft e.V. Bonn
Germany	Czarnecki,	Staatliches Gewerbeaufsichtsamt Stuttgart Stuttgart
Germany	Dafinger, Willibald Dr	Wacker Chemie GmbH Burghausen
Germany	Davids, Peter Dr	Landesumweltamt Nordrhein-Westfalen Essen
Germany	Deyhle, Christian	QUBUS GmbH Schwäbisch Gmünd
Germany	Dörr, Rolf-Dieter	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit Bonn
Germany	Dommes, Stefan	Degussa-Hüls AG Werk Lülsdorf Niederkassel
Germany	Dülsen, Uwe	Amt für Immissionsschutz Schwedt/Oder
Germany	Ehm, Carsten	Regierungspräsidium Darmstadt Darmstadt
Germany	Eiser, Dr	Lindenfarb Textilveredlung Julius Probst GmbH & Co. Abt. Umweltschutz Aalen-Unterkochen
Germany	Epperlein, Joachim Prof. Dr	e-consult Zwickau
Germany	Ertl, Gert Dr	BASF Aktiengesellschaft Ludwigshafen
Germany	Fackler, Richard Dr	Bayerisches Staatsministerium für Landesentwic klung und Umweltfragen Munich
Germany	Feldhaus, Gerhard Dr	Bonn
Germany	Fischer, Lothar	Deutsche Telekom Offenburg
Germany	Föll, Willi	Regierungspräsidium Darmstadt Abt. Staatliches Umweltamt Hanau Hanau
Germany	Franke, Hermann Dr	Bezirksregierung Hannover Hannover
Germany	Fritz, Michael	Stadt Stuttgart Amt für Umweltschutz Stuttgart
Germany	Fuchs, Burckhard	Staatliches Gewerbeaufsichtsamt Cuxhaven Cuxhaven

Country/ Organization	Name	Address
Germany	Fuchs, Carola	Regierungspräsidium Gießen Abt. Staatliches Umweltamt Marburg Marburg
Germany	Funk, Klaus	Schaefer Kalk KG Diez
Germany	Gamer, Peter	Staatsministerium für Umwelt und Landwirtschaft, Referat 63 Dresden
Germany	Geldermann, Jutta Dr	Deutsch-Französisches Institut für Umweltforschung (DFIU) Institut für Industriebetriebslehre und Industrielle Produktion (IIP) Universität Karlsruhe (TH) Karlsruhe
Germany	Gibs, Volker Dr	TRV Thermische Rückstandsverwertung Wesseling
Germany	Goetz, Rolf Dr	ARCADIS GmbH Darmstadt
Germany	Gohlke, Jerzy	Staatliches Gewerbeaufsichtsamt Emden
Germany	Greiner, Detlef Dr	DaimlerChrysler AG, Abt. FTU 0537 Stuttgart
Germany	Greiner, Wilfried Dr	Gewerbeaufsichtsamt Stuttgart Stuttgart
Germany	Groß, Martina	team für umweltberatung Reinheim
Germany	Grosser, Lothar	Staatliches Gewerbeaufsichtsamt Göttingen Göttingen
Germany	Gruber, Felix	Deutsche Bundesstiftung Umwelt Osnabrück
Germany	Grundmeier, Burkhard	WEG Wirtschaftsverband Erdöl- und Erdgasgewinnung e.V. Hanover
Germany	Gürcke, Frank	Umweltministerium Mecklenburg- Vorpommern Abt. Wasser und Boden Schwerin
Germany	Hackbusch, Thomas	Landesanstalt für Umweltschutz Baden-Württemberg Karlsruhe
Germany	Haegermann, Bernd Dr	Heidelberger Technology Center Heidelberg
Germany	Hähnel, Alexandra	Ecologic Berlin
Germany	Hagenah, Evelyn Dr	Umweltbundesamt Berlin
Germany	Halog, Anthony	Institut für Industriebetriebslehre und Industrielle Produktion Karlsruhe
Germany	Hannemann, Herbert	Norddeutscher Genossenschaftsverband e.V. Kiel

Country/ Organization	Name	Address
Germany	Hansemann, Wilfried	Verband der Lackindustrie e.V. Fachgruppe Holzlacke Weil der Stadt
Germany	Hasler, Josef	ZVO Lenkungsgruppe Umwelt Monheim a.R.
Germany	Hauber, Christiane Dr	Lederinstitut Gerberschule Reutlingen Reutlingen
Germany	Helble, Alfred	CM Consult Stuttgart
Germany	Hermann, Begoña	EcoTeam GmbH Trier
Germany	Herrmann, Jürgen Dr.	VEBA OEL AG Gelsenkirchen
Germany	Hesse, Cornelia	MAN AG Munich
Germany	Hildebrand, Manfred	VDEW Frankfurt/Main
Germany	Hildenbrand, Emil	Landesanstalt für Umweltschutz Baden-Württemberg Karlsruhe
Germany	Hobelsberger, Heinrich	DaimlerChrysler AG Stuttgart
Germany	Hoch, Klaus	SCA Hygiene Products Rosenheim
Germany	Hoelscher, Heinz-Werner	Ecologic Berlin
Germany	Hofmann, Klaus	Ministerium für Umwelt und Verkehr Baden-Württemberg, Referat 52 Stuttgart
Germany	Holzwarth, Fritz Dr	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit Bonn
Germany	Horn, Peter	Niedersächsisches Umweltministerium Referat 308 Hannover
Germany	Horster, Angelika	NABU Krefeld
Germany	Jäger, Dr	DLR Bonn
Germany	Jaeger, Martina	Stadt Leipzig Amt für Umweltschutz, SG Immissionsschutz Leipzig
Germany	Jeder, Petra Dr	VCI Frankfurt/Main
Germany	Joas, Reinhard Dr	BIPRO Munich
Germany	Julier, Franz	Grünzweig & Hartmann AG Abt. Umweltschutz, Arbeitssicherheit Ludwigshafen

Country/ Organization	Name	Address
Germany	Kacsóh, László Dr	Umweltrat (SRU) Wiesbaden
Germany	Kaltenmeier, Dieter Dr	Regierungspräsidium Freiburg Freiburg
Germany	Kampshoff, Klemens	Bezirksregierung Oldenburg Oldenburg
Germany	Keden, Heinz	Staatliches Umweltamt Schleswig Schleswig
Germany	Kessler,	Regierungspräsidium Karlsruhe Karlsruhe
Germany	Kieferle, Peter	Landratsamt Rems-Murr-Kreis Waiblingen
Germany	Kißler, Hermann	ABAG-itm GmbH Fellbach
Germany	Klein, Marion	Staatliches Amt für Umwelt und Natur Rostock
Germany	Knote, Harald Dr	Staatliches Gewerbeaufsichtsamt Heilbronn
Germany	Koenemann, Hans-Joachim Dr	Landesanstalt für Wasserwirtschaft Mainz
Germany	Koenig, Walther	Regierungspräsidium Tübingen Tübingen
Germany	Kofeld, Katrin	Bezirksregierung Braunschweig Braunschweig
Germany	Kohlhase, Olav	Ministerium für Umwelt, Natur und Forsten Kiel
Germany	Kraemer, Andreas	Ecologic Berlin
Germany	Krause, Gerhard Dr	EC Erdölchemie GmbH Cologne
Germany	Kretschmer, Frank	Staatliches Gewerbeaufsichtsamt Stuttgart Stuttgart
Germany	Krings, Claudia	Regierungspräsidium Darmstadt Staatliches Umweltamt Frankfurt Frankfurt/Main
Germany	Kröger, Werner	Bayerisches Landesamt für Umweltschutz Augsburg
Germany	Kruber, Helmut	Ministerium für Umwelt, Raumordnung und Landwirtschaft Nordrhein-Westfalen Düsseldorf
Germany	Kübitz-Schwind, Roland	Ministerium für Umwelt, Natur und Forsten Schleswig-Holstein Kiel
Germany	Kühne, Christian Dr	LfU Baden-Württemberg Karlsruhe
Germany	Küllmer, Jens	FDP-Landtagsfraktion Mainz
Germany	Künemund, Norbert	Staatliches Gewerbeaufsichtsamt Karlsruhe Karlsruhe

Country/ Organization	Name	Address
Germany	Kunz, Dr	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Landgrebe, Jürgen Dr	Umweltbundesamt, Fachgebiet III 2.1 Berlin
Germany	Langefeld, Lars	PriceWaterhouseCoopers Umweltberatung GmbH Frankfurt/Main
Germany	Langer, Hubertus Dr	Wieland-Werke AG Ulm
Germany	Lehmann, Bernd	Bezirksregierung Hannover Außenstelle Sulingen Sulingen
Germany	Liebscher, Heinz	ICI Autocolor Munich
Germany	Lindemann, Sibylle	Regierungspräsidium Stuttgart Stuttgart
Germany	Linnenkamp, Rolf	Ministerium für Umwelt, Raumordnung und Landwirtschaft Nordrhein-Westfalen Düsseldorf
Germany	Locher, Dietrich Dr	Dyckerhoff Zement GmbH Technische Zentralabteilung Wiesbaden
Germany	Lohaus, Johannes	ATV Hennef
Germany	Lohse, Joachim Dr	Ökopol-Institut für Ökologie und Politik GmbH Hamburg
Germany	Lotz, Dr	Emsland-Stärke GmbH Emlichheim
Germany	Lukner, Christian Dr	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit Bonn
Germany	Lutz, Georg Dr	Staatliches Gewerbeaufsichtsamt Freiburg Amt für Arbeits- und Umweltschutz Freiburg
Germany	Maiwald, Hans-Jürgen	Staatliches Amt für Umweltschutz Dessau / Wittenberg Dessau
Germany	Mappus, Stefan	Ministerium für Umwelt und Verkehr Baden-Wuerttemberg Stuttgart
Germany	Marquardt, Dr	Staatliches Gewerbeaufsichtsamt Heilbronn Heilbronn
Germany	Marscheider-Weidemann, Frank	Fraunhofer Institut für Systemtechnik und Innovationsforschung (FhG ISI) Karlsruhe
Germany	Marxsen, Ernst-August	Staatliches Umweltamt Schleswig Schleswig
Germany	Maule, Ulrich	Gretsch-Unitas GmbH Baubeschläge Ditzingen

Country/ Organization	Name	Address
Germany	Maurer, Ulrich Dr	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Maute-Kubin, Carola	Verband der Chemischen Industrie e.V. Landesverband Baden-Württemberg Baden-Baden
Germany	Maxion,	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Meier, Jürgen	Staatliches Umweltamt Düsseldorf Düsseldorf
Germany	Meier, Winfried	Milchindustrie-Verband e.V. Bonn
Germany	Menne, Andrea Dr	Staatliches Gewerbeaufsichtsamt Stuttgart Stuttgart
Germany	Meyer zu Riemsloh, Eckhard	Degussa-Hüls AG Frankfurt/Main
Germany	Mezger, Dr	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Mischer, Günter Dr	BAYER AG Konzernstab Qualitäts-, Umwelt- und Sicherheitspolitik Leverkusen
Germany	Mitsch-Werthwein, Claudia	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Müller, Arnold	Struktur- und Genehmigungsdirektion Süd Regionalstelle Gewerbeaufsicht Neustadt/W.
Germany	Müller, Kerstin	Fraunhofer-Gesellschaft Munich
Germany	Müller-Plankev, Henning	Struktur- und Genehmigungsdirektion Süd Regionalstelle Gewerbeaufsicht Neustadt/W.
Germany	Nähle, Carlos Dr	Südzucker AG Mannheim/Ochsenfurt Ochsenfurt
Germany	Neifer, Hans	Staatliches Gewerbeaufsichtsamt Tübingen Tübingen
Germany	Neukert, Michael	TÜV Süddeutschland Bau und Betrieb GmbH Karlsruhe
Germany	Neumaier, Nadja	Verlag R.S. Schulz GmbH Starnberg
Germany	Nolte, Rainer F. Dr	ECOTEC Institut für Chemisch-Technische und Ökonomische Forschung und Beratung Munich

Country/ Organization	Name	Address
Germany	Nunge, Sandrine	Deutsch-Französisches Institut für Umweltforschung (DFIU) Institut für Industriebetriebslehre und Industrielle Produktion (IIP) Universität Karlsruhe (TH) Karlsruhe
Germany	Obst, Ulrich Dr	Amt für Immissionsschutz Cottbus Cottbus
Germany	Olfert, Manfred	Ministerium für Umwelt, Natur und Forsten Schleswig-Holstein Kiel
Germany	Opel, Achim Dr	Degussa-Hüls AG Frankfurt/Main
Germany	Ott, Rigobert	Siemens AG Munich
Germany	Pätzold, Ralf Dr	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Paulus, Klaus	Springer-VDI-Verlag Redaktion Umwelt Düsseldorf
Germany	Peters, Bernadette Dr	DaimlerChrysler AG Abt. Umweltschutz Sindelfingen
Germany	Pfeiffer, Wolfgang	Regierungspräsidium Chemnitz Chemnitz
Germany	Platz, Karl-Heinz Dr	Staatliches Umweltfachamt Plauen Plauen
Germany	Plegnière, Peter	KRdL im VDI und DIN Düsseldorf
Germany	Pöhlig, Michael	Gesamtverband der Deutschen Textil- veredlungsindustrie (TVI-Verband) e.V. Bereich Umwelt und Technik Eschborn
Germany	Pollmann, Werner Prof.	DaimlerChrysler AG Stuttgart
Germany	Pongratz, Paul Dr	Regierung von Oberfranken Bayreuth
Germany	Potrykus, Alexander	Integrated Research Consulting and Expertises (IRCE) Munich
Germany	Pottschmidt, Axel	Baumann Krüger Eiding Rechtsanwälte Würzburg
Germany	Präfke, Kay	Deutscher Gießereiverband Düsseldorf
Germany	Pranghofer, Gernot G.	W.L. Gore & Associates GmbH Putzbrunn/Munich
Germany	Pregger, Thomas	IER, Universität Stuttgart Stuttgart
Germany	Probst, Reiner Dr	Merzig

Country/ Organization	Name	Address
Germany	Raab, Günter	Regierung von Niederbayern Landshut
Germany	Rahm, Klaus-Peter	Staatliches Gewerbeaufsichtsamt Freiburg Amt für Arbeits- und Umweltschutz Freiburg
Germany	Rebholz, Klemens	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Reichel, Almut	Umweltbundesamt, Fachgebiet III 2.1 Berlin
Germany	Reinhard, Harald	Adam Opel AG ITEZ, ME Umwelttechnik Rüsselsheim
Germany	Richter, Regine	TU Berlin Institut für Management in der Umweltplanung Berlin
Germany	Ricke-Herbig, Michael	Verein der Zuckerindustrie Bonn
Germany	Riebel, Michael	Regierungspräsidium Gießen Staatliches Umweltamt Wetzlar Wetzlar
Germany	Rittmann, Albrecht Dr	Ministerium für Umwelt und Verkehr Baden-Wuerttemberg Stuttgart
Germany	Rössner, Ellen Dr	Hessisches Ministerium für Umwelt, Landwirtschaft und Forsten Wiesbaden
Germany	Rohde, Sylvia	Sächsisches Landesamt für Umwelt und Geologie Dresden
Germany	Roos, Walter	Geschäftsbereich HUK/Direkt Casualty Risk Consulting Münchener Rückversicherungs-Gesellschaft Munich
Germany	Sager, Günter	Volkwagen AG K-EFUW Umweltplanung Wolfsburg
Germany	Salomon, Norbert Dr	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit Bonn
Germany	Sander, Knut	Ökopol-Institut für Ökologie und Politik GmbH Hamburg
Germany	Saskowski, Doris	Niedersächsisches Umweltministerium Hannover
Germany	Sauerland, Ulrich	Ministerium für Umwelt, Raumordnung und Landwirtschaft des Landes Nordrhein- Westfalen Düsseldorf

Country/ Organization	Name	Address
Germany	Schäfer, Heinz	Thüringer Ministerium für Landwirtschaft, Naturschutz und Umwelt Abteilung Wasserwirtschaft, Ref. 53 Erfurt
Germany	Schäfer, Thomas Dr	EnviroTex GmbH Augsburg
Germany	Schebek, Liselotte Dr	Forschungszentrum Karlsruhe Institut für Technische Chemie Zentralabteilung Technikbedingte Stoffströme Karlsruhe
Germany	Schell, Anke	DaimlerChrysler AG Abt. FTU, HPC 0531 Stuttgart
Germany	Schernikau, Ralf	Struktur- und Genehmigungsdirektion Nord Koblenz
Germany	Schielein, Jörg	Rödl & Partner GbR Nürnberg
Germany	Schlachta, Richard Dr	Bayerisches Landesamt für Umweltschutz Augsburg
Germany	Schloe, Kay Th. Dr	VDI - TZ Future Technologies Division Düsseldorf
Germany	Schlieckmann, Ferdinand Dr	Staatliches Gewerbeaufsichtsamt Stuttgart Stuttgart
Germany	Schlosser, Sabine	Staatliches Umweltamt Lippstadt Lippstadt
Germany	Schmid, Johann Dr	Regierung von Schwaben Augsburg
Germany	Schmidt, Karin	Fachgemeinschaft Textilmaschinen Frankfurt/Main
Germany	Schmidt, Karl-Heinz	Regierungspräsidium Tübingen Tübingen
Germany	Schmidt, Mario Prof.	Fachhochschule Pforzheim Pforzheim
Germany	Schmidt, Werner	Landesbank Baden-Wuerttemberg Stuttgart
Germany	Schmidtchen, Manfred	Staatliches Gewerbeaufsichtsamt Lüneburg Lüneburg
Germany	Schmidts, Marion	Regierungspräsidium Stuttgart Stuttgart
Germany	Schmitzer, Rainer	Regierung von Mittelfranken Ansbach
Germany	Schönberger, Harald Dr	Regierungspräsidium Freiburg Freiburg i.Br.
Germany	Scholz, Andreas	Regierungspräsidium Darmstadt Staatliches Umweltamt Frankfurt Frankfurt/Main
Germany	Schrempf, Gabriele Dr	Staatliches Gewerbeaufsichtsamt Göppingen Göppingen

Country/ Organization	Name	Address
Germany	Schröder, Uwe Dr	Regierungspräsidium Kassel Staatliches Umweltamt Kassel
Germany	Schubert, Gabriele Dr	Regierungspräsidium Stuttgart Stuttgart
Germany	Schubert, Hermann Dr	BAYER AG, KS-QUS Leverkusen
Germany	Schuler, Beate	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Schuster, Karl-Willi	Staatliches Gewerbeaufsichtsamt Karlsruhe Karlsruhe
Germany	Schwaab, Heinz-Ulrich	Regierungspräsidium Karlsruhe Karlsruhe
Germany	Schwarz, Hartmut	Staatliches Amt für Umwelt und Natur Rostock
Germany	Schwetje, Antje	Institut für Management in der Umweltplanung Berlin
Germany	Sessler, Berthold	Sessler GmbH Würzburg
Germany	Sieberger, B.-U.	Bundesvereinigung der Ernährungsindustrie e.V., Fa. Bahlsen Hannover
Germany	Sigl, Thomas	TÜV Süddeutschland Bau und Betrieb GmbH Munich
Germany	Sihler,	Universität Stuttgart Stuttgart
Germany	Sikorski, Andreas	Landesoberbergamt Nordrhein-Westfalen Dortmund
Germany	Stachel, Rudolf	ITAD Würzburg
Germany	Staeck, Florian Dr	Redaktion ENTSORGA-Magazin Frankfurt/Main
Germany	Steinborn, Dieter	C.F. Ploucquet GmbH & Co. Heidenheim
Germany	Steinle, Hanno	Kläranlagen Steinle Verfahrenstechnik GmbH Merklingen
Germany	Steinkemper, Hubert	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit Bonn
Germany	Stengler, Ella	AGS Schwabach
Germany	Streicher, Dieter	TÜV Bau und Betrieb GmbH, NL Dresden Dresden
Germany	Stumpenhusen, Burkhard	Staatliches Gewerbeaufsichtsamt Lüneburg Lüneburg
Germany	Suchomel, Horst Dr	HIMTECH GmbH Wiesbaden
Germany	Suhr, Michael	Umweltbundesamt Berlin

Country/ Organization	Name	Address
Germany	Swarowsky, Herbert	Regierungspräsidium Freiburg Freiburg i.Br.
Germany	Tams, Gerhard	Staatliches Umweltamt Schleswig Schleswig
Germany	Tebert, Christian	Dipl.-Ing. Technischer Umweltschutz Bonn
Germany	Tetzner, Rita	Dozentin für Personalmanagement, Kommunikationstraining, Beratungen Stollberg
Germany	Tessin, Niko	Deutscher Brauer-Bund e.V. Bonn
Germany	Theloke, Jochen	IER, Universität Stuttgart Stuttgart
Germany	Thiel, Reinhardt Dr	Verband Deutscher Papierfabriken Bonn
Germany	Tittel, Peter	Landesumweltamt Brandenburg Abt. Immissionsschutz Potsdam
Germany	Troge, Andreas Prof. Dr	Umweltbundesamt Berlin
Germany	Ullrich, Wolfgang	Staatliches Gewerbeaufsichtsamt Göppingen Göppingen
Germany	Valet, Dr	Ministerium für Umwelt und Verkehr Baden-Württemberg Stuttgart
Germany	Veltwisch, Dieter Dr	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit Referat WA I 3 Bonn
Germany	Vogl, Georg Dr	Verband der Umweltbetriebsprüfer und –gutachter e.V., c/o Eckes AG Nieder-Olm
Germany	Vollmer, Gerd	Landesamt für Umweltschutz und Gewerbeaufsicht Mainz
Germany	vom Berg, Wolfgang Dr	VGB Essen
Germany	Wackerbauer, Johann Dr	Institut für Wirtschaftsforschung (ifo) Munich
Germany	Wagner, Karl-Heinz	Staatliches Gewerbeaufsichtsamt Karlsruhe Karlsruhe
Germany	Walther, Kurt	Staatliches Umweltamt Kiel Kiel
Germany	Schwetje, Anja	Institut für Management in der Umweltplanung Berlin
Germany	Wasmuth, Dieter	Struktur- und Genehmigungsdirektion Süd Referat Wasserwirtschaft, Abfallwirtschaft und Bodenschutz Neustadt

Country/ Organization	Name	Address
Germany	Weber, Ralf-Peter	Sachverständigenbüro Dr. Kleinschmidt Abt. PRO TERRA TEAM Magdeburg
Germany	Weis, Michael Dr	Regierungspräsidium Gießen Abt. Staatliches Umweltamt Marburg Dezernat Industrielle Abfallwirtschaft Marburg
Germany	Weller, Rainer	Industrie- und Handelskammer Karlsruhe Abt. Industrie, Energiewirtschaft, Umweltschutz Karlsruhe
Germany	Wiest, Jürgen	Landesanstalt für Umweltschutz Baden-Württemberg Karlsruhe
Germany	Wohlfarth, Werner Dr	Dr. Werner Wohlfahrt Unternehmensberatung Umweltschutz Burscheid
Germany	Wolf, John	KRdL im VDl und DIN Düsseldorf
Germany	Wutz, Bettina	Verlag R.S. Schulz GmbH Starnberg
Germany	Xeller, Horst	Heidelberger Technology Center Heidelberg
Germany	Zimmer, Gerhard Dr	BASF Aktiengesellschaft Ludwigshafen
Germany	Zimmermann, Hartmut	Ministerium für Raumordnung und Umwelt des Landes Sachsen-Anhalt Abt. Wasserwirtschaft Magdeburg
Germany	Zimpel, Jörg	Regierungspräsidium Stuttgart Stuttgart
Germany	Zintel, Peter	Büro Zintel & Zintel Saarbrücken
Greece	Fatta, Despo	National Technical University of Athens Chemical Engineering Department 9 Heroon Polytechniou Athens
Greece	Gargoulas, Nikolaos	EPEM Ltd. Athens
Greece	Georgoulis, Leandros	Public Power Corporation of Greece Athens
Greece	Gryllia, Artemis	Ministry of the Environment, Physical Planning and Public Works General Direction of the Environment Division of the Air and Noise Pollution Control Department of the Industries Athens
Greece	Panagopoulos, Yannis	SYBILLA Ltd. Athens
Greece	Sioulas, Konstantinos	CRES Centre for Renewable Energy Sources Pikermi

Country/ Organization	Name	Address
Greece	Tsadari, Vassiliki	Public Power Corporation of Greece Athens
Hungary	Bulla, Miklós Prof. Dr	Hungarian National Council of Environment Budapest
Hungary	Mayer, Zoltán	National Society of Conservationists Budapest
Hungary	Mikó, János Dr	Prime Minister's Office Budapest
Hungary	Nam, Andrea	Ministry for Environment Budapest
IEEP	Haigh, Nigel	Institute for European Environmental Policy (IEEP) London
INTERGRAF	de Noose, Anne-Marie	International Confederation for the Printing and Allied Industries Brussels
Ireland	Clinton, Frank	Environmental Protection Agency Dublin
Ireland	Macken, Ken	Environmental Protection Agency Dublin
Ireland	Ó Cléirigh, Liam	Byrne Ó Cléirigh Ltd. Dublin
Italy	Astarita, Giuseppe	Federchimica Milano
Italy	D'Amico, Flaviano	ENEA CASACCIA Rome
Italy	Gardi, Stefano	Italcementi S.p.A. Bergamo
Italy	Gasparrini, Giuliana	Ministry of Environment Roma
Italy	Manduzio, Laura	ENEA CASACCIA Roma
Italy	Mantovani, Antonio	University of Padova Padova
Italy	Marcandalli, Bruno Prof.	Stazione sperimentale per la Seta Milano
Italy	Paci, Sandro	ENEA Roma
Italy	Pini, Alfredo	ANPA Roma
Italy	Tinti, Franco	ENEA Casaccia - Roma
Latvia	Shcherbaks, Valdemars	Latvian Environmental Investment Fund Riga
LHOIST	Schlegel, Thomas Dr	LHOIST Limelette
Lithuania	Kapturauskas, Jonas	Center for Environmental Policy Vilnius
Lithuania	Paliulyte, Rasuole	Ministry of the Environment of the Republic of Lithuania Vilnius

Country/ Organization	Name	Address
Luxemburg	Henry, Emmanuel	Centre de Ressources des Technologies pour l'Environnement (CRTE) Esch-sur-Alzette
Luxemburg	Weidenhaupt, André Dr	Centre de Ressources des Technologies pour l'Environnement (CRTE) Esch-sur-Alzette
Luxemburg	Welfring, Joëlle	Centre de Ressources des Technologies pour l'Environnement (CRTE) Esch-sur-Alzette
Netherlands	Apperlo, Menno	Provincie Groningen AP Groningen
Netherlands	Bakx, R.C.	M & O Training and Consultancy Halfweg
Netherlands	Bijsterbosch, Jowi	RIZA Lelystad
Netherlands	Buring, Mike	Provincie Limburg Maastricht
Netherlands	de Jong, Nynke	Provincie Groningen Groningen
Netherlands	de Jonge, Lex	Ministry of Environment The Hague
Netherlands	de Vries, Gerard	RIZA Lelystad
Netherlands	Geurs, Monique	Provincie Groningen Groningen
Netherlands	Huydts, Rob	ENCI Maastricht
Netherlands	Leendertse, Arjen	Information Centre for Environmental Licensing (InfoMil) The Hague
Netherlands	Pietermaat, Daniel	Ministry of Economic Affairs The Hague
Netherlands	Taal, Marcel	Information Centre for Environmental Licensing (InfoMil) The Hague
Netherlands	ten Hove, Jan	Provincie Groningen Groningen
Netherlands	van der Sleen, Pieter-Geert	Provincie Groningen Groningen
Netherlands	van Dijk, H.P.	DCMR Environmental Agency Rijnmond s Schiedam
Netherlands	Verhoef, J.A.G.	VNCI Leidschendam
Norway	Faerden, Tor	Norwegian Pollution Control Authority Oslo
Norway	Lahti, Monika	Norwegian Pollution Control Authority Oslo
Norway	Jaeger, Per Chr.	Norwegian Pollution Control Authority Oslo

Country/ Organization	Name	Address
Poland	Kamieniecki, Krzysztof	Institute for Sustainable Development Warsaw
Poland	Sitnicki, Stanislaw	The EcoFund Foundation Warsaw
Portugal	Faria da Costa, Margarida	Direcção Geral do Ambiente Rua da Murgueira - Zambuyal Amadora
Portugal	Martins Carvalho, Arnaldo	Ministry of Agriculture Direcção Geral do Veterinária Lisbon
Portugal	Milheiras Costa, Alexandre	Direcção Geral do Ambiente Amadora
Portugal	Moura, Aurea	Direcção Geral do Ambiente Amadora
Portugal	Pinheiro, Luísa	Direcção Geral do Ambiente Amadora
Portugal	Quintela, Catarina	Direcção Geral do Ambiente Amadora
Portugal	Salino, Luis	Ministry of Agriculture Direcção Geral do Veterinária Lisbon
Portugal	Santos, Pedro	QUERCUS - Associação Nacional de Conservação da Natureza Lisbon
Portugal	Serpa Pinto, Maria Delfina	Direcção-Geral da Indústria Lisboa
Portugal	Soares, Aires	Ministry of Agriculture Direcção Geral do Veterinária Lisbon
Slovak Republic	Misiga, Pavel	Environmental Training Project (ETP) Bratislava
Slovenia	Dermelj, Marjana	Umanotera Slovenian Foundation for Sustainable Development Ljubljana
Slovenia	Leban, Janja	Chamber of Commerce and Industry Ljubljana
Slovenia	Zerjav, Janko	Ministry of Environment Ljubljana
Spain	Anta, Maria Eugenia	FEIQUE Madrid
Spain	Avelusveda Bargués, Albert	Government of Catalunya Departament de Medi Ambient Barcelona
Spain	Barrios, Patricio	Atlantic Copper, S.A. Huelva
Spain	Choy i Tarrés, Antoni	Government of Catalunya Departament de Medi Ambient Barcelona
Spain	Contreras, Jesús	Atlantic Copper, S.A. Huelva

Country/ Organization	Name	Address
Spain	de Sancho, Maria Jesus Rodriguez	Ministry of the Environment Madrid
Spain	Monfà i Obach, Esther	Centre for Cleaner Production Initiative, s.a. Ministry of the Environment Autonomous Government of Catalonia Barcelona
Spain	Pelegrí i Aixut, Josep Maria	Government of Catalunya Departament de Medi Ambient Barcelona
Spain	Perrault, Jean Yves	Saint-Gobain Spain Madrid
Spain	Targhetta, Javier	Atlantic Copper Madrid
Sweden	Björkhem, Magnus	Environmental Court Växjó
Sweden	Bodin, Inge	Östersunds Tingsrätt Environmental Court Östersund
Sweden	Hydén, Lars	Svea Hovrätt Miljööverdomstolen Stockholm
Sweden	Jirvall, Nils	Swedish Forest Industries Federation Stockholm
Sweden	Lagergren, Staffan	Vänersborgs tingsrätt Vänersborg
Sweden	Lindgren, Hans-Roland	Swedish Environmental Protection Agency Stockholm
Sweden	Nyström, Erik	Swedish EPA Stockholm
Switzerland	Crivelli, Eros	Divisione Ambiente Cantone Ticino Bellinzona
Switzerland	Gerber, Jürg	algroup alusuisse Niederglatt
Switzerland	Schubert, Roland	Thermoselect s.A. Locarno
Switzerland	Sollberger, Benjamin Dr	BUWAL Bern
United Kingdom	Brooks, Paul	Corus Group (British Steel Ltd.) Rotherham
United Kingdom	Clements, Steve	BOC Gases Sheffield
United Kingdom	Cox, Martin	Environment Agency of England and Wales Buckley
United Kingdom	Crowther, Andrew	SRM Limited Morecambe
United Kingdom	Dawson, Graham	British Non-Ferrous Metals Federation Birmingham
United Kingdom	Emmott, Neil	IEEP London

Country/ Organization	Name	Address
United Kingdom	Farrow, Linda	Environment Agency of England and Wales Buckley
United Kingdom	Ganzleben, Catherine	University of Oxford Oxford
United Kingdom	Hardy, Paul	British Sugar plc Peterborough
United Kingdom	Hollins, Steve	British Non-Ferrous Metals Federation London
United Kingdom	Lange, Bettina	Aberystwyth University Department of Law Denglaes
United Kingdom	Ledgerwood, Ken	Environment and Heritage Service Belfast
United Kingdom	Quinn, Martin	Environment Agency of England and Wales Buckley
United Kingdom	Solanki, Ashwin	British Sugar plc Peterborough
United Kingdom	Stearn, Stuart	Environment Agency of England and Wales Buckley
United Kingdom	Sweeney, Daniel	Department of Trade and Industry London
United Kingdom	Town, Steve	Department of Environment, Transport and the Regions London
United Kingdom	Wardle, Dave	BOC Gases Guidlford
United Kingdom	Williams, Dave	CIAA/Unilever Heswall

Publications by the Federal Environmental Agency
in the TEXTE series are available subject to advance
payment of DM 20,-- **(10,26 Euro)** by bank transfer, crossed cheque
or paying-in form to

Account number 4327 65 - 104 at the
Postbank Berlin (Sorting Code 10010010)
Fa. Werbung und Vertrieb
Ahornstraße 1-2
10787 Berlin

At the same time please direct your written order to the Firma Werbung und Vertrieb naming the volume number from the TEXTE series, and the name and address of the orderer.

Publisher: Federal Environmental Agency (Umweltbundesamt)
Postfach 33 00 22
14191 Berlin
Tel.: +49/30/8903-0
Telex: 183 756
Telefax: +49/30/8903 2285
Internet: http://www.umweltbundesamt.de

Edited by: Section III 2.1
Almut Reichel

Price: DM 20,-- (10,26 Euro)

Berlin, July 2000