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EXPERT GROUP ON BEST AVAILABLE
TECHNIQUES AND BEST ENVIRONMENTAL
PRACTICES
First Meeting
Research Triangle Park, 10-14 March 2003

REPORT OF THE FIRST SESSION OF THE EXPERT GROUP ON
BEST AVAILABLE TECHNIQUES AND BEST ENVIRONMENTAL PRACTICES

I. OPENING OF THE SESSION

1. The sixth session of the Intergovernmental Negotiating Committee of the Stockholm Convention on Persistent Organic Pollutants, held from 17-21 June 2002 in Geneva, Switzerland, established the Expert Group on Best Available Techniques (BAT) and Best Environmental Practices (BEP) to develop guidelines on BAT and provisional guidance on BEP relevant to the provisions of article 5 and annex C of the Convention. The mandate and terms of reference for the Expert Group can be found in UNEP/POPS/EGB.1/INF.7.
2. The first session of the Expert Group on BAT and BEP was held in Research Triangle Park, North Carolina, United States of America from 10 to 14 March 2003.
3. The session was opened at 9.00 a.m. on Monday, 10 March 2003 by Mr. John Whitelaw, Deputy Director, UNEP Chemicals who welcomed the participants on behalf of Mr. Klaus Töpfer, Executive Director of UNEP.
4. At the opening session, statements were made by Ms. Susie Hazen, Deputy Assistant Administrator, Office of Prevention, Pesticides and Toxic Substances, United States of America, Environmental Protection Agency (EPA), Mr. John Buccini (Canada), Chair of the Intergovernmental Negotiating Committee, read by Mr. Whitelaw, and the interim Co-chairs of the Expert Group, Mr. Robert Kellam (United States of America) and Mr. Sergio Vives (Chile).
5. Ms. Hazen drew the attention of the meeting to the important task ahead and commended the full spectrum of expertise from countries, international organizations and non-governmental bodies present at the meeting. She reiterated the goals of the Stockholm Convention to prevent pollution from persistent organic pollutants, noting that those chemicals had no boundaries and remained in the environment for a long time. Developing guidelines for BAT and provisional guidance for BEP, she said, was one of the first important tasks to be undertaken intersessionally since the signing of the

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Convention. The guidelines and guidance should be both useful and practical and would be an element to be included by countries in the development of their national action plans. She provided the meeting with an update of the progress of the United States of America towards ratification of the Convention and closed by wishing the meeting success.

6. Mr. Whitelaw read a statement from Mr. Buccini which noted that the BAT/BEP Expert Group had been established in recognition that countries would need assistance in meeting obligations under the Convention that dealt with by-products. He emphasized that the goal for by-products as provided for in article 5 of the Convention was continuing minimization and elimination where feasible. Application of BAT and BEP was required, but guidance was not defined. That would be the responsibility of the current Expert Group. The recommendations of the Expert Group on guidelines and guidance for BAT and BEP needed to be dynamic, flexible and readily updateable. He reminded the Expert Group that its work should cover both BEP and BAT. He also reminded the Expert Group that it was technical and not a negotiating body. The outcome of the meeting would be submitted to the seventh session of the Intergovernmental Negotiating Committee and the report should include progress made, issues outstanding and a timetable of work. He closed by thanking the government of the United States of America and the EPA for hosting the meeting.

7. Mr. Vives noted that article 5 and annex C were among the main provisions of the Convention. Requirements for the use of BAT for new sources as well as the promotion of BEP were included and should be carried out in accordance with the guidelines to be developed and within the specified timeframe. The guidelines should be realistic and applicable in every country without causing economic disruption and must allow for the goals of the Convention to be carried out in accordance with the needs and specific conditions of developing countries. That implied important commitment from countries and the presence of experts from developing countries and countries with economies in transition was vital to the success of the meeting as those countries would be the principal users of the guidelines. He noted that an important element for the discussion of the group would be the difference between BAT and BEP for which there was as yet no clear difference but for which a clear distinction had been made in the Convention.

8. Mr. Kellam welcomed the experts to the EPA and noted that there were now 151 signatories and 30 ratifications to the Convention. Building on Mr. Vives' statement he said that key to the development of the national action plans was an understanding of what constituted BAT and BEP. Time was getting short to do the work to be accomplished before a first possible meeting of the Conference of the Parties. The efforts of preparing national action plans weighed most heavily on developing countries and countries with economies in transition, he said, and it was incumbent on developed countries to assist those countries. He reminded the meeting that the Convention called for development of guidelines and guidance taking into account the technical characteristics of the installation concerned, geographical location and local environmental conditions and, in that regard, reiterated the importance of a geographically balanced representation at the meeting. He closed by saying that the outcome of the meeting should be timely, understandable and balanced and that the Expert Group must weigh the merits of being practical and concise versus comprehensive and complicated. Finally he said the guidelines should be a living document with a view to updating whenever necessary.

9. A list of documents available to the meeting was provided in UNEP/POPS/EGB.1/INF/12.

Attendance

10. The meeting was attended by the following government-designated experts: Mr. Juan Carlos Colombo (Argentina), Ms. Susanna Eberhartinger (Austria), Mr. Patrick G. Finlay (Canada), Mr. Sergio Vives (Chile), Ms. Vibeke Vestergaard Nielsen (Denmark), Ms. Indhira de Jesus Salcedo (Dominican Republic), Ms. Vandana Naidu (Fiji), Ms. Hille Hyytiä (Finland), Mr. Emmanuel Fiani (France), Mr. Jean-Baptiste Babadounga (Gabon), Ms. Steffi Richter (Germany), Ms. Ute Karl (Germany), Mr. Stefan Einarsson (Iceland), Mr. Shinichi Sakai (Japan), Mr. Marat Ishankulov

(Kazakhstan), Mr. Francis Njuguna Kihumba (Kenya), Ms. Cristina Cortinas de Nava (Mexico), Mr. Sharav Dagva (Mongolia), Mr. Jerzy Stanislaw Michalik (Poland), Mr. Seuk Woo Kang (Republic of Korea), Ms. Branka Andric (Serbia and Montenegro), Mr. Simon Buckland (New Zealand), Mr. Lim Kew Leong (Singapore), Ms. Michaela Braun (Sweden), Mr. Peter Hofer (Switzerland), Mr. Mike Collins (United Kingdom), Mr. Robert Kellam (United States of America) and Mr. Nelson Manda (Zambia). Experts from the following countries were unable to attend: Algeria, Australia, Islamic Republic of Iran, Italy, Nigeria, Saudi Arabia, Turkey and Venezuela.

11. Representatives of the following intergovernmental organizations and United Nations specialized agencies were also present: United Nations Environment Programme and United Nations Industrial Development Organization.

12. The following non-governmental organizations were also represented: Greenpeace International, International Council of Chemical Associations, International Council on Mining and Metals, International POPS Elimination Network, The European Cement Association, World Chlorine Council and World Wildlife Fund.

13. The list of participants was provided in UNEP/POPS/EGB.1/INF/11.

II. ORGANIZATIONAL MATTERS

A. Practical arrangements

14. A brief outline of the practical arrangements for the meeting was provided to the Expert Group.

B. Election of Officers

15. Pursuant to section VII of annex VII of UNEP/POP/INC.6/22, the following experts were elected to serve as officers of the Expert Group:

Mr. Robert Kellam (United States of America)	Co-chair
Mr. Sergio Vives (Chile)	Co-chair

C. Organization of the Work

16. The Expert Group agreed to work in plenary sessions from 9.00 a.m. to 12.00 p.m. and from 1.00 p.m. to 5.00 p.m. and to set up break-out groups and task groups as necessary.

17. The Expert Group adopted the following agenda:

1. Opening of the session
2. Organizational matters
 - a. Practical arrangements
 - b. Election of officers
 - c. Organization of work
 - d. Report by the secretariat on preparatory work for the session
3. Development of guidelines on best available techniques and provisional guidance on best environmental practices relevant to the provisions of article 5 and annex C of the Stockholm Convention on Persistent Organic Pollutants.

4. Preparation for the next session
5. Other matters
6. Adoption of the report
7. Closure of the session

D. Report by the secretariat on preparatory work for the session

18. The secretariat provided an oral report on the preparatory work for the first session of the Expert Group, including of the BAT/BEP workshops in Bangkok, Thailand, 13 to 15 March, 2002 and Buenos Aires, Argentina, 21 to 24 October, 2002. The proceedings of those workshops were available to the Expert Group in documents UNEP/POPS/EGB.1/INF/4 and UNEP/POPS/EGB.1/INF/8 respectively. A summary of the Buenos Aires workshop including its conclusions was also available as UNEP/POPS/EGB.1/INF/6.

III. DEVELOPMENT OF GUIDELINES ON BAT AND PROVISIONAL GUIDANCE
ON BEP RELEVANT TO THE PROVISIONS OF ARTICLE 5 AND ANNEX C
OF THE STOCKHOLM CONVENTION

A. Scope of work of the Expert Group

19. The Co-chair recalled the mandate given to the Expert Group by the Intergovernmental Negotiating Committee as found in paragraphs 70-79 and annex VII of UNEP/POPS/INC.6/22 and in UNEP/POPS/EGB.1/INF/7. Terms of reference for the Expert Group noted that the guidelines and guidance to be developed should take into consideration problems and opportunities that might be encountered in implementing BAT and BEP, particular circumstances of developing countries and some countries with economies in transition and available mechanisms for information exchange of BAT and BEP measures.

(i) Introduction of article 5 and annex C

20. The secretariat provided a brief introduction to article 5 and annex C of the Convention emphasizing that article 5 related to unintentional production of POPs and that the purpose of the Expert Group was to develop guidelines for BAT and guidance for BEP to enable Parties to implement article 5. He noted that article 5 mandated each Party to take a number of measures to reduce the total releases derived from anthropogenic sources of the chemicals listed in annex C with the goal of their continued minimization and, where feasible, ultimate elimination. Further, it promoted the use of BAT for new sources and BAT and BEP for existing sources according to the categories listed in Parts II and Part III of annex C. The guidelines would be adopted by the Conference of the Parties.

(ii) Form and nature of the guidelines and guidance

21. The Expert Group had before it a note by the secretariat on possible options for the structure and level of detail of the guidelines and guidance to be developed as contained in UNEP/POPS/EGB.1/2. That document contained an overview of the guidance provided to the Expert Group for the development of the guidelines on BAT and guidance on BEP including possible elements for those guidelines and provisional guidance drawn from discussions held at the sixth session of the Intergovernmental Negotiating Committee.

22. The Expert Group considered the document a good basis on which to begin its work and suggested that some specific examples could be included of some BAT and BEP measures. The issue of cost-effectiveness was raised in the context of the development and implementation of the guidelines. It was emphasized that the guidelines should involve environmentally sound decision-making. One representative suggested that the guidelines themselves could be short and restricted to principles and that annexes could be developed to include more detailed information that could be updated on a regular basis. This would assist countries with different capacities to implement the guidelines and guidance.

23. Representatives reiterated that new sources required firm guidelines for BAT whereas guidelines for existing sources could be implemented in an incremental stepwise manner. Several representatives considered that there should be separate guidelines and guidance for new and for existing sources. Others felt there could be general guiding principles applicable to all sources followed by more specific techniques and practices for specific categories. Proposals for a possible structure were introduced by members of the Expert Group. The Expert Group developed draft elements for consideration in development of the guidance, a draft structure for the provisional guidance and types of techniques and practices for an example category which are reflected in the following working documents: possible structure of guidance on BEP and guidelines on BAT which is included in annex A; draft elements for consideration in the development of guidance for BEP and guidelines for BAT which is included in annex B; and an example of management options for cement kilns which is included in annex C of the present document. These represent the initial thoughts of the Expert Group. They do not represent a consensus of the Group or the ultimate scope or form that the provisional guidance may take. They are intended solely for the purposes of discussion during the intersession and as a place to resume work at the next meeting of the Expert Group.

(iii) Introduction to and definition of best available techniques and best environmental practices

24. The Expert Group had before it a note by the secretariat, UNEP/POPS/EGB.1/INF/3, containing a non-exhaustive review of the use of the terms BAT and BEP in other international forums as well as in the Stockholm Convention.

25. It was noted that, while BAT was defined and conceptually developed in the text of the Convention, BEP was not defined to the same extent. Some difficulty was experienced on the delineation between the two terms. One representative suggested that the distinction between the two terms was only relevant to new and major sources. It was considered that there was some overlap in the two terms and that, certain issues could fall under either or both terms. It was further suggested that a distinction between the two terms was in the application. Some representatives noted that requiring the use of specific techniques might be difficult to impose at the local level but that setting emission standards and limits to be met was more feasible.

26. It was reiterated that BAT was defined in the Convention to not be prescriptive and to take into account the technical characteristics of an installation, its geographical location and the local environmental conditions. It was noted that care should be given not to make BAT so prescriptive that it was either ignored or that it would lead to other environmental problems. One representative said that BAT could be considered as the minimal environmental requirement in an integrated approach while BEP was a more overarching notion that might include policies and strategies. Representatives of environmental non-governmental organizations pointed out that in article 5 and annex C under BAT it is clearly stated that, when considering proposals for new facilities priority consideration should be given to alternative processes, techniques and practices that do not form or release unintentional POPs but have similar usefulness. They suggested that the guidance should also elaborate a methodology for Parties to use in considering broader alternatives and examples of such alternatives. Some experts expressed concern about the magnitude of such a task and whether it was within the scope of the mandate of the Expert Group.

27. Several representatives suggested that BAT reference documents produced under the information exchange provisions contained in article 16 (2) of the European Union Directive on Integrated Pollution Prevention and Control as well as strategies and standards developed in the United States of America and in Canada could be used as a starting point from which to develop guidelines for BAT. Those directives and strategies could then be adapted to be more readily applicable, flexible, practical and cost-effective to recognize the particular needs of developing countries and countries with economies in transition.

B. Developments of guidelines and guidance by groups of source categories

28. In the general discussion it was considered that the guidelines should be flexible and allow for different speeds of implementation to take into account both the differences between developing and developed countries but also the different levels of development among developing countries. The notion of continuous minimization had to be captured. The guidelines should not be prescriptive or they would be too difficult to implement. One representative noted the importance of taking into account small and medium size enterprises lacking the financial capability to convert to BAT. It was considered important to address the question of alternatives and to provide a range of technological solutions. The cost effectiveness and viability of the BAT was very important. Attention was drawn to the provisions in the Convention regarding priority consideration by Parties of alternatives and substitute processes that did not generate POPs.

(i) Overview of source categories addressed by the Convention in annex C Parts II and III

29. The Co-chairs referred to the note (UNEP/POPS/EGB.1/3) by the secretariat providing a table with major source categories organized into four groups and explained that the rationale for the categorization was to facilitate the discussion and was not an attempt to redefine the Convention. Several experts suggested alternate ways in which the categories could be grouped. The Co-chairs confirmed that the four groups were made only to facilitate the overview presentations and opening discussion.

30. It was noted that the source category list in Part III was open-ended, could be expanded within the national action plan as required and contained several sources of potential high releases. Several experts stated that the importance of those Part III releases could increase proportionally as reductions in releases of Part II sources were achieved. Many representatives emphasized the need to differentiate between new and exiting sources.

(ii) Group 1: Large stationary production processes

31. Under this agenda item, presentations on large thermal production processes were made by Mr. Don Litten (invited expert from the Institute for Prospective Technological Studies, Joint Research Centre, European Commission) on the Reference Documents on BAT prepared under the European Union Integrated Pollution Prevention and Control Directive and by Mr. Denis Kemp (International Council on Mining and Metals) on the metal producing sector.

32. During the discussion under this item representatives noted that challenges to implementing BAT/BEP could be different in developing countries. It was suggested that ideally BAT would be performance based but take into account operating conditions and total releases must be considered. Representatives recognized the need to take into account evolving science and technology. The different methods of monitoring including periodic, continuous and real-time were discussed, as were their costs and availability. The full implementation of BAT across a sector would require some time. Representatives reiterated the need for a non-prescriptive process and recognition of economic and cultural differences. For developing countries the notion of minimization was important as efforts could be made to achieve reductions even if it was a minimal quantity.

(iii) Group 2: Non-thermal industrial processes utilizing (free) chlorine

33. Under this agenda item, presentations were made by Mr. William Carroll (International Council of Chemical Associations) on the chlorine production and processing industry and by Mr. Litten on pulp and paper production. It was noted that the chemical industry could be a small source for unintentionally produced by-products if BAT was installed and good practices maintained. Representatives questioned the existence of standards for production of chlorinated pesticides, dyes and other chemicals in developing countries, and noted that mercury cells continued to be exported from the developed to the developing world. Additional information was provided by Mr. Arseen Seys (World Chlorine Council) who informed the meeting of the commitment of European Chloralkali Industry not to export mercury cells and of a voluntary global programme of the World Chlorine Council to promote practices that result in dioxin and furan reduction, including training and awareness-raising and guidance on proper installation. Industry representative were requested to provide information intersessionally on the opportunities to reduce unintentional POPs releases from existing sources in the chemical industry category.

34. With regard to BAT for pulp and paper production, experts noted that a range of different techniques for bleaching, production of different paper qualities and customer needs had to be considered. Recalling that general release measures should be applied to new or substantially modified facilities, representatives suggested that further clarification of the term "substantial" would be useful. Further, with regard to investment for BAT, long-life expectancy and short-life expectancy should be differentiated in existing sources. All aspects of environmental issues should be addressed in BAT investment. Some representatives said that both an inventory and BAT were needed for HCB.

(iv) Group 3: Waste management and disposal

35. Under this agenda item, presentations on waste management were made by Ms. Pat Costner (Greenpeace International) on BAT and BEP for municipal waste management and by Mr. Jose Luis Izquierdo (invited expert from Procesan S.A.) on medical waste treatment.

36. In the discussion under this item it was recognized that awareness-raising in the field of waste management was crucial. Specific regulations on waste disposal were lacking in developing countries and often incinerators were not regulated. Regulations for disposal by incineration and open burning were urgently needed. It was suggested that waste disposal could best be managed at the source and clear guidance was requested on combustion and non-combustion options. Many representatives emphasized the need to understand the waste stream, to adopt a holistic approach to waste generation and disposal and to work in harmony with efforts being undertaken within the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal.

37. It was recognized that open burning was a common mode for disposal of wastes, and an understanding of the relationship between those practices and the release of dioxins and furans would benefit from further study. With regard to incineration it was noted that the design of the facility as well as training and operating norms and performance specifications were important. This was particularly true for developing countries where there were many small-scale incinerators operating below performance standards. It was noted that the separation of hazardous wastes from non-hazardous, for example in the case of medical wastes, was not always undertaken. Options and approaches for BAT guidelines for incineration and guidance for separation of wastes were required. Representative also noted the importance of ensuring that all techniques and practices met regulatory emission standards. In that regard, guidance on accurate analysis and costing thereof was requested.

(v) Group 4: Diffuse activities

38. Under this agenda item, presentations on diffuse activities were made by Mr. Brian Gullett (invited expert from the National Risk Management Research Laboratory, EPA) on dioxins and furans from uncontrolled combustion and Mr. Nelson Manda (Zambia) on the challenge of technology

transfer in developing countries. In discussions on uncontrolled combustion, it was noted that minimization of dioxin/furan emissions can be achieved through good combustion. There was also discussion of the relative importance of other variables including sources of chlorine, metals, compression and wetting. The discussions noted that open burning is often resorted to when proper waste management options do not exist. One representative suggested that the Expert Group should adopt a cautionary approach with regard to open burning and as far as possible identify alternatives so that this activity can be prohibited. Some representatives reminded the meeting that the use of waste oil from refineries in fuel and as wood preservatives as well as of spent engine oil was also of concern. Following a discussion on forest fires, biomass and landfill burning one representative offered to provide to the next meeting examples of BEP pilot projects in South-East Asia aimed at preventing and minimizing forest fires.

39. With regard to technology transfer to developing countries it was noted that the parameters were not well defined and that barriers to technology transfer differed to those in developed countries. There was also lack of economic incentives and weak enforcement and monitoring capacities as well as poor general understanding of dioxins issues with greater priority being placed on problems related to development and poverty. Smaller developing countries, it was noted, might not individually have the capacity to undertake the development of recycling industries. It was suggested that regional action and south-south information exchange should be promoted.

40. One representative informed the meeting of the Latin America Network for the Management of Wastes that emphasized the importance of regional networking and partnerships. It was noted that if waste incineration facilities were banned, alternatives to that solution had to be proposed. While the need for alternatives and ways of developing a market for recycling were important it was recognized that information exchange programmes and regional action plans and cooperation should be promoted. A holistic approach had to be assumed where not only improvements in technology were considered. One representative noted that in countries with economies in transition privatisation laws impacted heavily on economic and environmental issues.

IV. PREPARATION FOR THE NEXT SESSION

41. The Expert Group noted the desirability of intersessional work to prepare for its next meeting. Several members of the Group volunteered to coordinate assembly and synthesis of information relating to source categories:

- (a) cement kilns
- (b) open burning
- (c) medical waste incinerators
- (d) pulp and paper production using chlorine
- (e) chemical production
- (f) non-ferrous metal production

42. Collection of relevant reference documents and other information was also deemed useful. A member of the Group volunteered to coordinate the compilation of this information.

43. Experts are requested to provide input on the above activities to the coordinators by 8 September 2003. The coordinators are to compile the input received for submission to the secretariat by 8 October 2003.

44. The second session of the Expert Group is tentatively scheduled from 8 to 12 December 2003. Mr. Sergio Vives (Chile) indicated the possible interest of his Government to host this meeting. A final decision on this is to be made by April 2003. The tentative offer by Chile was welcomed by the Expert Group. Offers to support the session by Governments of Switzerland, Germany and Canada were noted.

V. OTHER MATTERS

45. It was noted that it was unfortunate that the Expert Group did not enjoy full participation of the designated members at the current meeting. The Expert Group urged regional coordinators to ensure full representation by the designated members at the next session of the Expert Group.

VI. ADOPTION OF THE REPORT

46. The Committee adopted its report on the basis of the draft report contained in document UNEP/POPS/EGB.1/L.1, which had been circulated during the session, as amended, and on the understanding that finalization of the report would be entrusted to the Co-chairs working in consultation with the secretariat.

VII. CLOSURE OF THE SESSION

47. Following the customary exchange of courtesies, the Co-chairs declared the session closed at 5:15 p.m. on Friday, 14 March 2003.

Annex A

Possible structure of guidance on BEP and guidelines on BAT

- I. Introduction
 - A. Convention provisions (article 5 and annex C)
 - B. Principles (see annex B of the present report)
 - C. Implementation flowchart with description

- II. Best environmental practices
 - A. General considerations
 - B. Policy issues (including assessment of options, environmental assessment of new projects, pollution prevention/control (hierarchy), education, reporting, etc.)
 - C. Scientific and technological issues (evolving; research and development)
 - D. Economic and social implications (new vs. existing facilities; relative priorities)
 - E. Legal frameworks (national and subnational)

- III. Best available techniques
 - A. New sources
 - B. Existing sources
 - C. Content:
 - (1) Process description
 - (2) Sources of unintentionally produced POPs
 - (3) Primary and secondary measures
 - (4) Performance standards
 - (5) Performance reporting
 - D. Guidelines table by source category (See annex C of the present report for an example)
 - E. Annexes: Applicable existing national and sub-national standards, guidelines or guidance for BAT
 - F. References: Applicable reference material from various sources, including assessment methods and measurement techniques

Annex BDraft elements for consideration in the development of
guidance on BEP and guidelines on BAT

Note: Not all elements may be applicable for all sources and for all countries, recognising their specific situations and circumstances. An assessment of UPOP (unintentional persistent organic pollutant) emissions from the source category should precede consideration of BEP and BAT.

The document will state the target audience for this guidance.

[Incorporate the full wording of article 5, annex C of the Convention]

In developing guidance on BEP and BAT, the Expert Group has given consideration to the following. Guidance should:

1. Reflect a process for continuous minimization, which recognises that minimal releases cannot be achieved for all source categories simultaneously;
2. Present an incremental (step-wise) approach to achieve release reductions for existing sources;
3. Enable environmentally sound decision making to be made in a speedy and timely manner;
4. Reflect cost-effective options for control technologies and management steps;
5. Be multi-level with respect to control technologies and management options, allowing country by country decision making taking into account circumstances and particular requirements of developing countries;
6. Be readily accessible and understandable. Provide general and informative information with citation by reference to supporting technical information;
7. Subject to revision to accommodate
 - (i) changes in regulatory regimes and
 - (ii) improvements in technology and practices.
8. Be non-prescriptive at a general level, recognising that, in some instances, detailed specifics may be appropriate
9. Assist countries in developing their national action plans, and commitments in meeting their obligations under the Stockholm Convention
10. Be based on proved/robust technologies and management options (i.e. those that have been demonstrated to be effective and sustainable on a commercial basis)
11. Recognise the importance of robust scientific information in developing this guidance;
12. Recognise the need to further evolve science and technology through research and development;
13. Recognise there will be differences in regulatory and non-regulatory frameworks between countries;
14. Recognise that the guidance needs to be applicable to developed countries, developing countries and countries with economies in transition;
15. Acknowledges the need of education and training for implementation of guidance.

Annex C

Management of Cement kilns

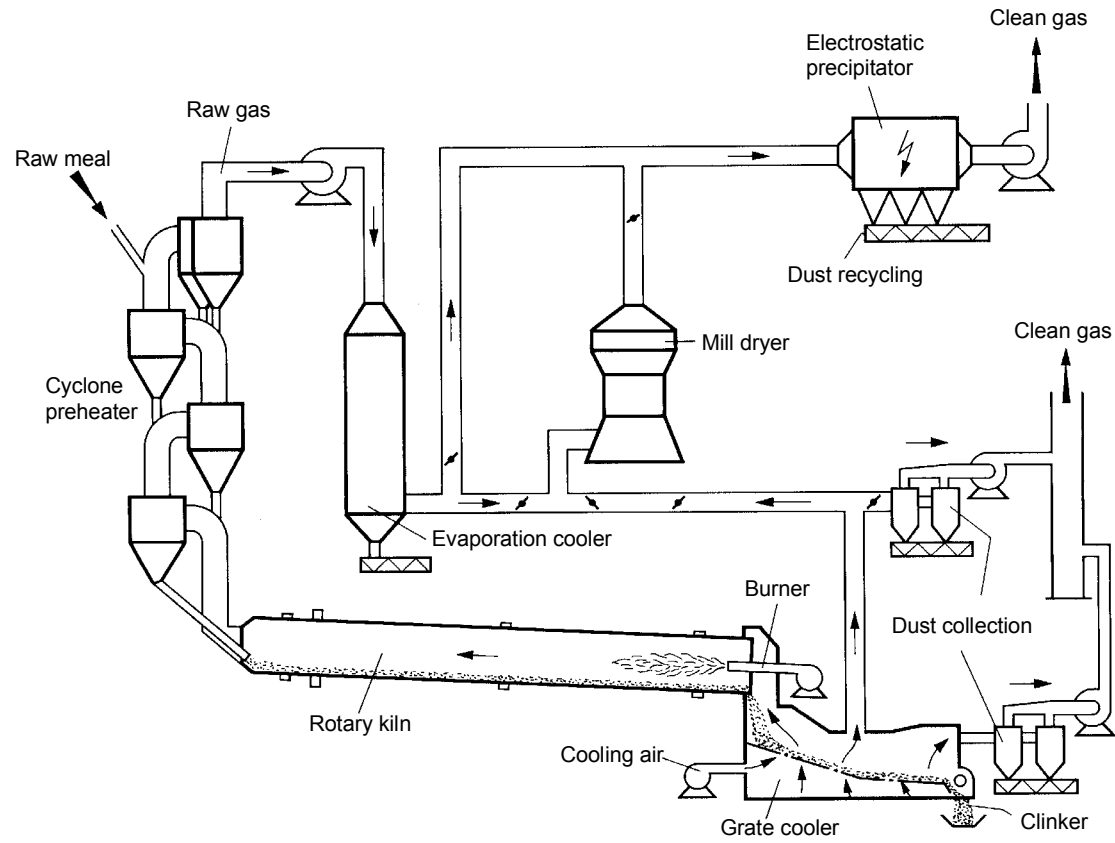


Figure: Rotary kiln with cyclone pre-heater and waste gas dust collection

Production Process

There are four main process routes for the manufacture of cement; the dry, semi-dry, semi-wet and wet processes:

- In the **dry process**, the raw materials are ground and dried to raw meal in the form of a flowable powder. The dry raw meal is fed to the pre-heater or pre-calciner kiln or, more rarely, to a long dry kiln.
- In the **semi-dry process** dry raw meal is pelletised with water and fed into a grate pre-heater before the kiln or to a long kiln equipped with crosses.
- In the **semi-wet process** the slurry is first dewatered in filter presses. The filter cake is extruded into pellets and fed either to a grate pre-heater or directly to a filter cake drier for raw meal production.
- In the **wet process**, the raw materials (often with high moisture content) are ground in water to form a pumpable slurry. The slurry is either fed directly into the kiln or first to a slurry drier.

Typical kiln exhaust gas volumes expressed as m³/Mg of clinker (dry gas, 101.3 kPa, 273 K) are between 1700 and 2500 for all types of kilns. Suspension pre-heater and pre-calciner kiln systems normally have exhaust gas volumes around 2000 m³/Mg of clinker (dry gas, 101.3 kPa, 273 K).

Kiln systems with 5 cyclone pre-heater stages and pre-calciner are considered standard technology for ordinary new plants, such a configuration will use 2900-3200 MJ/Mg clinker. To optimise the input of energy in other kiln systems it is a possibility to change the configuration of the kiln to a short dry process kiln with multi stage preheating and pre-calcination. This is usually not feasible unless done as part of a major upgrade with an increase in production. The application of the latest generation of clinker coolers and recovering waste heat as far as possible, utilising it for drying and preheating processes, are examples of methods which cut primary energy consumption.

Electrical energy use can be minimised through the installation of power management systems and the utilisation of energy efficient equipment such as high-pressure grinding rolls for clinker comminution and variable speed drives for fans.

Energy use will be increased by most type of end-of-pipe abatement. Some of the reduction techniques described below will also have a positive effect on energy use, for example process control optimisation.

General measures for management

- (1) General infrastructure, paving, ventilation.
- (2) General control and monitoring of basic performance parameters.
- (3) Control and abatement of gross air emissions (gases NO_x, SO₂, particles, metals).
- (4) Development of environmental monitoring (establishing standard monitoring protocols).
- (5) Development of audit and reporting systems.
- (6) Implementation of specific permit and audit systems for waste burning.
- (7) Demonstration by emission monitoring that a new facility can achieve a given emission limit value.

Specific measures

Management options			
In reviewing technology the dry process technology is preferred as BAT in major retrofit or new processes.			
Characterize a good operation and use this as a basis to improve other operational performance.			
Having characterized a good kiln, establish reference data by adding controlled doses of hazardous waste (i.e. non-hazardous waste fuels) and look at changes and required controls and practice to control emissions.			
Cement kilns feeding hazardous waste need to have provision of practices to protect workers on the handling of those materials.			
The off gas dust should be recycled back to the kilns to the maximum where practicable to reduce the disposal issues and related possible emissions. Dust, that can not be recycled, should be managed in a manner to be demonstrated to be safe.			
Recognize there is a distinct difference in feeding hazardous waste as opposed to non hazardous waste.			
Hazardous waste should not be fed to the secondary burners or pre-heaters.			
Consistent long term supply of secondary feeds and hazardous waste (supplies of a month or more) is required to maintain stable conditions in the operation.			
a) Primary measures and process optimization to reduce PCDD/PCDF			
○ Continuous supply of fuel and waste with			
<ul style="list-style-type: none"> - specification of <ul style="list-style-type: none"> ▪ Heavy metals, ▪ Chlorine (limitation, product/ process dependent), ▪ Sulphur. 			
<ul style="list-style-type: none"> - Input controls. 			
<ul style="list-style-type: none"> ○ Pre-treatment of waste (waste specific) with the objective to provide a more homogeneous feed leading to good combustion and more stable conditions: <ul style="list-style-type: none"> - Drying - Shredding - Mixing - Grinding 			
○ Well maintained and appropriate storage of fuel			

Management options			
○ Well maintained and appropriate storage and handling of hazardous wastes and sites			
○ Feeding of waste through the main burner or the secondary burner at pre-calciner/pre-heater kilns [temperature > 900oC]			
○ No waste feed as part of raw-mix if it includes organics (not relevant for UPOPs formation)			
○ Stabilisation of process parameters <ul style="list-style-type: none"> - Regularity in fuel characteristics (both alternative and fossil) - Regular dosage - Excess oxygen - Monitoring of CO 			
○ No waste feed during start-up and shut down			
○ Quick cooling of kiln exhaust gases lower than 200°C			
Primary measures have shown to be sufficient to reach in existing installations 0.1 ng/m³. Monitoring should be done. If all of these options do not lead to a performance lower than 0.1 ng/m³ secondary measures may be considered such as			
b) Secondary measures:			
○ Activated carbon filter			
○ Selective catalytic reduction (SCR)- Efficient dust abatement			
○ Further improvement of dust abatement and recirculation of dust			Captures UPOPs bound by particles

For general principles at all:

Public access to the information and reporting system.