

TO: CHRISTOPHER MARSHALL, ENVIRONMENT CANADA  
FROM: MIKE HARRIS, MEMBER OF THE INTERSESSIONAL WG ON POPS WASTE GUIDELINES  
SUBJECT: COMMENTS ON DRAFT POPS WASTE GUIDELINES  
DATE: 5 JUNE 2004  
CC: PIERRE PORTAS (SBC), IBRAHIM SHAFII (SBC)

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**General Technical Guideline for Environmentally Sound Management of Wastes  
Consisting of, Containing or Contaminated with  
Persistent Organic Pollutants  
Comments on 15 May 2004 Draft**

On behalf of the chemical industry, I submit the following comments as a member of the small intersessional working group acting under the auspices of the Technical Working Group of the Basel Convention. The comments relate to the draft dated 15 May 2004.

We have previously submitted comments (dated 19 March 2004) on the previous (22 February 2004) draft of this guideline. The consultants were tasked by OEWG-3 (in April 2004) to take account of the comments on the 22 February draft submitted prior to or during OEWG-3.

We acknowledge that it has not been possible in the time available since OEWG-3 for the consultants to take full account of these earlier comments and that they intend to do so while incorporating comments made following OEWG-3, i.e. on the present 15 May 2004 draft. However, some of our earlier comments have been incorporated following discussions at OEWG-3 in April 2004: others have been superseded by the outcome of those discussions. Therefore, in order to simplify the work of the consultants and the lead country, we have incorporated in the present comments those portions of our earlier comments that remain relevant and added such further comments on the new draft as seem appropriate.

Thus the present comments supersede and replace our earlier (19 March) comments on the earlier (22 February) draft. We request careful attention to our latest comments, as they constitute the final opportunity to improve the present draft prior to its translation into languages for submission to COP-7.

In our comments we have, wherever possible, offered actual text. However, we have not used mark-up mode because of the possibility of confusion arising from the marking-up of a document already extensively marked-up – and also to shorten these comments. New text is in blue font and deleted text in red font. In some cases, particularly in the detailed section on destruction technologies, it has not been felt appropriate to offer specific text as further research is required by the consultant in order to provide answers to questions raised at OEWG-3 (and also raised, in many cases, by UNIDO) and the final text will depend on the outcome of this research. In a few other cases, we have not offered – or only tentatively offered – text, as the topics are complex and merit further discussion within the intersessional working group.

We appreciate the opportunity to make these comments and look forward to seeing an improved draft in early August. We understand that comments will in due course be solicited on the proposed August draft and that any such further comments will be taken into account at a meeting of the small intersessional working group immediately prior to COP-7 and also, as necessary, during COP-7 itself prior to finalisation and adoption of the text of the guidelines.

*Mike Harris, for the World Chlorine Council*

## 1. GENERAL

The unconventional use of the singular acronyms PCB, PCT and PBB to stand for the plural forms “polychlorinated biphenyls”, “polychlorinated terphenyls” and “polybrominated biphenyls” respectively leads to numerous inconsistencies in the text and some very ugly expressions such as “PCB are” (*sic*). Worse still – probably because of the sheer ugliness of the mixed number phrases – the text is not even consistent in its usage. Could we please revert to the conventional practice of using the acronyms to stand for the singular forms and making plurals of the acronyms by the addition of a lower case “s”? Thus “PCB” should stand for “polychlorinated biphenyl” and “PCBs” for “polychlorinated biphenyls”.

## 2. INTRODUCTION

### 2.1 Scope

#### Paragraphs 2 and 3

We accept the inclusion of PCTs and PBBs in the scope of these guidelines even though they are not POPs and not subject to the Stockholm Convention. We also note with appreciation the improvement in the relevant text since the previous draft. However, we believe that further amendments are still required in order that the text be both factually correct and unambiguous.

We suggest that:

- o The chapeau to paragraph 2 be replaced by the following:  
[Five categories of wastes are addressed in this document:](#)  
It is not factually correct, or necessary, to use the word “POPs” in a chapeau covering a mixture of POPs and non-POPs.
- o The text of sub-paragraph (i) of paragraph 2 be replaced by the following:  
[Polychlorinated biphenyls \(PCB\) \(including the polychlorinated terphenyls \(PCT\) and polybrominated biphenyls \(PBB\); these are included owing to similarities in the physico-chemical and toxicological properties of these substances even though they are not POPs and thus not subject to the Stockholm Convention\);](#)
- o The footnote to sub-paragraph (iii) of paragraph 2 be replaced by the following:  
[HCB features three times in this list to reflect its status as an industrial chemical, as a pesticide \(fungicide\) and as an unintentionally produced POP.](#)
- o Paragraph 3 be deleted (as the point is now covered in sub-paragraph (i) of paragraph 2.

The placement of the text describing the special status of PCT and PBB in these guidelines is better placed in the sub-paragraph dealing with PCB to which it closely relates, rather than in a separate paragraph. The amendment of the HCB footnote is self-explanatory in the light of the welcome addition of the parenthetical text to sub-paragraph (v) of paragraph 2. The replacement of square brackets by (nested) parentheses in sub-paragraph (i) is to avoid confusion as square brackets are conventionally used to indicate text that has yet to be agreed – and square brackets are (correctly) so used elsewhere in the guidelines (e.g. in Section 3).

#### Paragraph 7

Replace the existing text by:

[It is noted that guidance on best available techniques \(BAT\) and best environmental practices \(BEP\) as these apply to the prevention or reduction of releases of the unintentionally produced POPs listed in Annex C of the Stockholm Convention is provided in the Convention and is being further elaborated by an Expert Group appointed for that purpose by the sixth session of the Intergovernmental Negotiating Committee \(INC-6\) of that Convention.](#)

This better describes the status and work of the Stockholm Convention BAT-BEP Expert Group, reflects the wording of the Convention and notes that there is already some guidance in Annex C of the Convention.

#### Paragraph 8

Replace the existing text by the following:

POPs are for the most part of anthropogenic origin; for some POPs, e.g. those listed in Annex C of the Stockholm Convention, minor quantities are also generated by natural processes.

This amendment is intended to be only editorial. It is recognised that the text of this paragraph was discussed at OEWG-3 and it is not intended to reopen that debate – however, the text in the present draft does not read as English to the present reviewer.

#### Paragraph 9 (footnote)

Change “sites” to “references” – the bibliography is, quite rightly, not limited to Internet URLs.

### 3. RELEVANT PROVISIONS FOR POPS WASTES IN THE BASEL AND STOCKHOLM CONVENTIONS

#### 3.1 General

We consider it essential that Section 2.1 be carefully reviewed and edited by the Secretariat to the Basel Convention for consistency with that Convention and note that this was requested in Canada’s e-mail of 14<sup>th</sup> May.

We believe that it is equally important that Section 2.2 be carefully reviewed and edited by the Interim Secretariat to the Stockholm Convention for consistency with *that* Convention and hope that UNEP Chemicals will be able to carry out this function. We regret that this was not explicitly requested in Canada’s e-mail as we assign high priority to ensuring the consistency of these Guidelines with the Stockholm Convention and the accurate portrayal of its provisions.

#### 3.2 Heading

This is one of several examples where the use of the word “POPs” in this guidelines is not correct as PCTs and PBBs are to be included – a problem that exists only in the ‘general’ guideline, as the ‘daughter’ guidelines can simply refer by name to the substances within scope.

Change by deleting the words “for POPs wastes”.

#### 3.3 Basel Convention

##### Paragraph 17

Annex I to the Basel Convention does not list “some of the wastes that may consist of, contain or be contaminated with POPs” - it lists “Categories of Wastes to be Controlled”. This is one of many examples of lax wording that tends to interpret a Convention. A better wording in this particular instance might be: “Annex I list categories of wastes to be controlled. Some of these may consist of, contain or be contaminated with POPs, for example:”.

##### Paragraph 18

It would seem particularly unlikely that pharmaceutical wastes could be contaminated with by-product PCDDs/PCDFs as few if any pharmaceutical production processes use the sort of conditions (high temperatures, oxidising atmosphere) that might generate such by-products. Delete the second sentence “For example ... unintentional formation”.

WCC has expert knowledge of processes for the production of PVC and does not believe that any such process involves the use of HCB as an intermediate and/or additive. Amend the penultimate sentence to delete “PVC,”.

It is not appropriate to refer to PCTs in a paragraph that begins "POPs may occur as contaminants ...", as PCTs are not POPs. Delete "... adhesives and plastics, while PCT to a lesser extent ..." by "... adhesives and plastics. PCTs, to a lesser extent, were also used ...".

#### Paragraph 20

In the last sentence of the chapeau the words "this section" refer grammatically to the last-mentioned section, i.e. Annex IX. From the context it appears that the author means to refer to Annex VIII. The list that follows is not, in any case, a list of POPs wastes – it is a list of hazardous wastes, some of which are likely to contain POPs. Replace this sentence by "Examples of hazardous wastes listed in Annex VIII that may contain POPs are:".

### 3.4 Stockholm Convention - waste related provisions

We believe that it is very important that Section 2.2 be carefully reviewed and edited by the Interim Secretariat to the Stockholm Convention for consistency with *that* Convention and hope that UNEP Chemicals will be able to carry out this function. We regret that this was not explicitly requested in Canada's e-mail of 14<sup>th</sup> May, as we assign high priority to ensuring the consistency of these Guidelines with the Stockholm Convention and the accurate portrayal of its provisions.

#### Paragraph 23

Insert "are not POPs and thus" after "PCT and PBB" at the beginning of the sentence – in order to explain *why* they are not subject to the Stockholm Convention. This added clarity is an essential counterweight to the potential confusion introduced by including these non-POPs in the POPs Guideline.

#### Paragraph 26

It would be better – and no lengthier – to cite the Convention rather than to attempt a paraphrase, if this paragraph is really deemed necessary. As a minimum, replace "is to transfer" by "is to transmit" to conform to the wording of the Convention. It would be better to replace the entire paragraph by a citation of Article 7(1) of the Convention. It would be better still to drop the whole paragraph.

#### Paragraph 27

Add article 1(e) of Article 6 to the *verbatim* citation of the text of the Convention. It is very confusing to omit this single sub-paragraph and deal with it in a later paragraph of the guidelines. As a consequence, in the last sentence of the chapeau, replace "These provisions include:" by "These provisions are:".

#### Paragraphs 28 and 29

These paragraphs relating to Articles 3 and 5 of the Stockholm Convention tend to interpret or paraphrase the text of the Convention and should be removed – or brought into line with the Convention by the use of *verbatim* citations – as has been done, most appropriately, in the revision of the preceding paragraphs relating to Article 6 of the Convention.

#### Paragraph 30

Delete "Article 6, paragraph 1(e) ... environmentally sound manner." and insert the text of paragraph 1(e) of Article 6 into a full citation of the Article in paragraph 27 of the guideline (see above). It is confusing to separate out this single paragraph of this crucial Article into a separate place in the guideline.

## 4. ISSUES UNDER THE STOCKHOLM CONVENTION TO BE ADDRESSED COOPERATIVELY WITH THE BASEL CONVENTION

### 4.1 Low POP content

#### Paragraph 33

WCC notes the provisional definitions developed at OEWG-3 and comments as follows:

- The value of 50 mg/kg for PCB seems reasonable.

- The value for PCDD / PCDF should be set at 50 µg TEQ/kg. This is because:
  - The lower values are so low that parties would experience major analytical problems in determining whether or not a particular waste did or did not meet the criterion for “low POP content”.
  - Certain commodity products (leather wallets, shoes, socks) in Germany were found to contain PCDD/PCDF levels up to 10 µg TEQ/kg. While these levels are admittedly exceptional and are expected to fall in future, it does not seem appropriate to require elaborate destruction technologies for consumer goods at the point where they become waste. Issues of analysis and segregation would be extremely difficult to implement.
  - For wastes with PCDD/PCDF content below 50 µg TEQ/kg the absence of an obligation to destroy or irreversibly transform does not relieve the obligation to deal with the waste in an environmentally sound manner. It merely allows consideration of a wider range of options to achieve the environmental objective. Where destruction or irreversible transformation is practical and environmentally sound it is not precluded.
- The value for “other POPs” should be set at 50 mg/kg. This is because:
  - There is no reason to suppose that the “other POPs” are environmentally more harmful than PCBs, for which a level of 50 mg/kg is generally accepted.
  - For wastes with POP content below 50 mg/kg the absence of an obligation to destroy or irreversibly transform does not relieve the obligation to deal with the waste in an environmentally sound manner. It merely allows consideration of a wider range of options to achieve the environmental objective. Where destruction or irreversible transformation is practical and environmentally sound it is not precluded.

#### **4.2 Levels of destruction and irreversible transformation**

##### **Paragraph 34**

###### General comments

###### *For POPs other than PCDD/PCDF*

We support conditions (i), (ii) and (iii). We believe that the appropriate limit value for PCB in solid residues from waste treatment should be 10 mg/kg. Lower levels could be very hard to achieve without repeated processing that in itself may risk distributing low levels of PCBs more widely and diffusely into the environment with little prospect of subsequent recovery.

###### *For PCDD/PCDF*

Special considerations apply to the very small quantities of PCDD/PCDF that may remain in solid residues after waste treatment. The quantities involved are very small, as are the concentrations, and may – according to details of the technology employed – be residual from the input stream and/or generated *de novo* in trace quantities during the waste treatment process itself. It is further noted that the presence of PCDD/PCDF in wastes arises only from the unintentional generation of these POPs, not from their deliberate production. Nor do stockpiles of PCDD/PCDF waste materials exist, although some stockpiles may be contaminated with low levels of PCDD/PCDF incidental to their primary composition. Finally, the definition of low POP content is likely to be three orders of magnitude lower for PCDD/PCDF than for the other POPs (see comments on paragraph 33 above).

These special considerations have a number of consequences for any decision on “level of destruction”, *inter alia*:

- It is not easy, and may be impossible, to assess criterion (i) for these wastes as it may not be possible to evaluate the technology with a waste containing over 1% of PCDD/PCDF. Such wastes are unlikely to exist and no one would wish to generate such a material with so high a content of PCDD/PCDF simply in order to evaluate a technology.
- Numerical limits for PCDD/PCDF in solid residues from waste treatment would have to be set very low (consistent with, although not necessarily identical to, the definition of low POP

content). This would pose major difficulties with regard to sampling and analysis of waste residues. In some cases we might be approaching levels close to the “natural” background for industrial areas of industrialised countries.

At OEWG-3 a few participants suggested alternative approaches better suited to dealing with the special circumstances associated with PCDD/PCDF in wastes. Discussion was limited by the time available, although some interesting and potentially usefully suggestions were made. WCC would like to expand on these comments as follows:

- Where the technology employed results in solid waste residues whose PCDD/PCDF content is at or below the level defined as “low POP content” then, although the definition of low POP content is for a different purpose under Article 6 of the Stockholm Convention, it is reasonable to assume that the resulting solid residues need not themselves be destroyed or irreversibly transformed so long as they are disposed of in an environmentally sound manner.
- Where the solid waste residues contain PCDD/PCDF at a level somewhat higher than that defined as “low POP content” it may still be the case that destruction or irreversible transformation of the residues is not the environmentally preferable option.
- In either case, the decision as to whether or not a technology may be regarded as meeting the Stockholm Convention requirement for destruction or irreversible transformation *in terms of PCDD/PCDF* is less important than the decision as to whether the technology meets the requirements for POPs in general and results in emissions that are within acceptable limits and solid residues whose PCDD/PCDF (and other POP) content is low enough that they can be disposed of in an environmentally sound manner.
- A synthesis of these comments could result in text along the following lines, which we propose as a basis for further discussion:

*“For waste treatment technologies that satisfy the above criteria {i.e. those applicable for POPs other than PCDD/PCDF} for POPs other than PCDD/PCDF, the quantitatively defined destruction efficiency in sub-paragraph (i) need not be met with respect to PCDD/PCDF concentrations, nor need the PCDD/PCDF content of residues from the waste treatment meet quantitative criteria of the kind set out for other POPs in sub-paragraph (ii), on condition that:*

- *The technology can reliably provide for destruction or irreversible transformation leading to a PCDD/PCDF content in solid residues that is below the “low POP content” {as defined above}, or*
- *The solid residues from waste treatment can be disposed of in an environmentally sound manner, whether by further treatment or by other means where further treatment is not the environmentally preferable option.”*

#### Other comments on the draft text

In sub-paragraph (i) replace “waste consisting of, containing or contaminated with POPs with a POP content above 1 per cent” by “waste containing above 1 per cent of POPs”.

This is what was agreed at OEWG-3 and simply indicates that the technology should be capable of the stated DE when the input stream contains 1% or more of POPs (even though, by implication, it may not achieve this DE when the input stream is more dilute in POPs) – whether this POPs content is regarded as “containing” or “being contaminated with”.

The more complex wording was not intended or proposed by the participants in the discussion of this point at OEWG-3 and is not appropriate, or even meaningful, in the context of this paragraph. It could, for example, be interpreted as requiring the stated DE for a waste merely “contaminated” (perhaps to the extent of 0.1%) with a very dilute POP component (perhaps containing 1% of POP), i.e. the DE would be required for an input stream containing only 0.001% POPs. Equally, the more complex wording refers to “wastes consisting of ... POPs with a POP content above 1%”, which is meaningless. If the waste consists of POPs, its POPs content is 100%.

## 5. GUIDANCE ON ENVIRONMENTALLY SOUND MANAGEMENT (ESM)

### 5.1 *General Considerations: Basel Convention*

#### Paragraphs 38 to 44

These paragraphs should be edited by the Secretariat to the Basel Convention for consistency with the original source documents. Wherever possible the text should cite from, and not paraphrase, the text of the Convention. Citations should be placed within quotation marks and italicised to make it clear that they *are* citations.

#### Paragraph 38

Amend the first sentence to read, "Article 2, paragraph 8 of the Basel Convention **defines** environmentally sound management ..."

#### Paragraph 41

If the "key principles" described are, as is stated, "articulated in the 1994 Framework Document on Preparation of Technical Guidelines for the Environmentally Sound Management of Wastes subject to the Basel Convention" then it is surely not the case – as is also stated – that these principles are "embodied in the Basel Convention". The latter terminology suggests that the principles are part of the Convention itself. Delete "**The Basel Convention embodies ... articulated in**" and add at the end of the sentence "**sets out several key principles**".

#### Paragraph 42

It does not seem appropriate to speak of a "Framework Document" on the preparation of guidelines as "stipulating" conditions. Delete "**stipulates**" and replace by "**recommends**".

### 5.2 *General Considerations: Stockholm Convention*

#### Paragraph 45

The reference to paragraph 6.2(b) of the Stockholm Convention is too narrow. This sub-paragraph deals only with "environmentally sound disposal". At this point in the present Guideline we are discussing "environmentally sound management" – a much wider concept. Those topics mandated to the appropriate bodies of the Basel Convention under Article 6.2 of the Stockholm Convention are wider than "environmentally sound disposal" but narrower than "environmentally sound management". The parenthetical text is thus confusing.

Insert "**However,**" at the beginning of the second sentence and delete "**(as per 6.2(b) of the Stockholm Convention)**".

### 5.3 *Legislative and Regulatory Framework*

#### Paragraph 50

Delete "**environmental impairment,**". We have never before heard this expression and have no idea what it might mean in a legislative context. We see no value in attempting an *ab initio* definition and very much doubt whether it would be possible to arrive at any international consensus within a reasonable period of time. It is more likely that an attempt to define at the national level would lead to a loss of harmonisation and distract from the goals of the Conventions.

#### Paragraph 52

Delete "**define ESM and**". We see no value in attempting an *ab initio* definition and very much doubt whether it would be possible to arrive at any international consensus within a reasonable period of time. It is more likely that an attempt to define at the national level would lead to a loss of harmonisation and distract from the goals of the Conventions.

#### Paragraph 54

Delete the final sentence. The wording of the Conventions is defined (and agreed internationally). There is no room for "dependence" or "uncertainty" in terms of the obligations of the Parties.

## Paragraph 57

To bring this paragraph into line with the Stockholm Convention, amend the final sentence to read as follows: "... requires, [subject to review by the Conference of the Parties](#), the complete elimination ...".

## Paragraph 60

The statement that Article 4.3 of the Basel Convention "requires that violations of legislation that implements the Convention be considered criminal offences" does not appear to be correct. The Article reads, "The Parties consider that illegal traffic in hazardous wastes or other wastes is criminal". This is not at all the same thing – and is limited to traffic in wastes, not extended to all legislation implementing the Convention as the draft guideline currently states. **Delete this paragraph** – or at least reword completely on the advice of the Basel Secretariat.

## Paragraph 68

In order to bring the text into line with the Basel Declaration, replace "... [international organizations, industry non-governmental organizations and ...](#)" by "... [international organizations, the industry sector, non-governmental organizations and ...](#)".

## 5.4 *Waste prevention and minimization*

### Paragraph 75

**Delete this paragraph**, which does not relate to "waste prevention and minimization" and [insert the paragraph in Section 4.7.1 on Pre-treatment](#), where it belongs.

## 5.5 *Identification and Inventories*

### Paragraphs 76 to 91

It is questionable how much of this material really falls within the scope of the guideline. If it is to be retained it would benefit from being considerably shortened. It also needs to be edited, e.g. by UNEP Chemicals, to check that it is consistent with existing UNEP documents on these matters.

Further specific points are listed below.

### Paragraph 77

Replace "[are generated](#)" by "[are mostly generated](#)", to allow for the recognition of natural sources – some of which are, in fact, also amenable to some minimisation (e.g. measures to minimise the impact of forest fires), an opportunity for action that should not be dismissed.

### Paragraph 79

Amend second sentence to read: "A national inventory [is](#) necessary ...".

### Paragraph 81

While the PRTR Protocol to the Aarhus Convention is a valuable contribution, it is far from being the only such – and many countries are not (at least yet) party to the Protocol (or even the Convention). It is questionable whether it is worth singling out this particular example, while various countries (e.g. Canada) have their own well-established systems. Consider deleting this paragraph or at least rephrasing it as "one example".

### Paragraph 83

Replace "[or, if still in business, destroyed their records regarding these products.](#)" by "[or records may no longer exist.](#)"

The present wording implies an ulterior motive or even malpractice, whereas it is normal business practice (consistent with proper corporate governance and effective management, and unrelated to any matters of environmental policy) for every company to have and comply with a "document retention policy" that mandates the conditions and specifications both for retention and for destruction of documents.

## Paragraphs 84 to 91

While this is a good first attempt at a plan for developing an inventory there are a number of important activities that seem to have been omitted. If the section is retained then a great deal of further work is required on paragraphs 91 to 98. UNEP Chemicals could usefully contribute here in view of their excellent work on preparing guidelines for the development of dioxin inventories.

## Paragraph 89

As specific examples of the need for major editing of much of this material, this paragraph includes a number of steps that are unnecessary and/or inappropriate, e.g.

- The reporting in detail of non-POP chemicals – while this may be a good thing to do, it has nothing to do with the present guideline)
- The reporting of “safety and environmental status” – this is so broad as to be meaningless. If this is to be included, a further dozen pages or more should be added to the guideline (!) to offer guidance and definition. This highlights the need for a careful approach to the definition of the scope of this guideline.

## 5.6 *Sampling, Analysis and Monitoring*

### Paragraphs 92 to 106

It is very questionable how much of this material falls within the scope of the guideline. If it is to be retained it would benefit from being considerably shortened. It also needs to be edited, e.g. by UNEP Chemicals, to check that it is consistent with existing UNEP documents on these matters.

### Paragraph 95

Add as a new first bullet: “ensuring that sampling complies with any relevant local or national legislative and/or regulatory requirements and with any relevant international standards.”

### Paragraph 98

It does not seem appropriate in this paragraph of a UN document to cite only the standards procedures of a single country. The US example should be removed, or examples from other continents should be added.

Also, add a statement to the effect that any local or national standard should be validated against any relevant international standards to ensure comparability.

### Paragraph 104

Add a new sentence after “period of time” to read “Field testing may also involve *in situ* monitoring.”

### Paragraph 105

Delete the sentence “However such tests ... results.” This statement, while true, applies also to laboratory testing and is not a characteristic of field-testing as is here implied.

### Paragraph 106

The current draft text ends in mid-sentence at “(Research, development and monitoring)”. In fact Article 11 of the Stockholm Convention is not particularly relevant to POPs wastes. Delete the words “The Stockholm Convention’s Article 11 (Research, development and monitoring)”.

## 5.7 *Handling, collection, packaging, labelling, transportation and storage*

### Paragraph 107

Replace “... handled separate ...” by “... handled separately ...”.

### Paragraph 110

The third bullet should be reconsidered. It may not always be practical (or even possible) to include “all possible POPs wastes”, e.g. in the context of hazardous wastes of household origin.

## Paragraph 120

Replace “with expertise in the fields of waste management and occupational health and safety” by “with relevant expertise, *inter alia* in the fields of civil engineering and construction, waste management and health and safety”. The present listing of skills is too limiting and omits some absolutely crucial skills such as civil engineering. Some of the worst environmental incidents associated with hazardous wastes have occurred because of inadequate attention to civil engineering principles in designing temporary or permanent storage facilities!

### 5.8 Environmentally sound destruction and disposal: Pre-treatment

#### Paragraph 122 bis

Insert the text of the present paragraph 75 (see above) here where it best fits. The advice regarding mixing is essentially a general and important caveat when considering pre-treatment of wastes. I.e.

“Mixing of wastes with a POP content above a defined ‘low POP content’ with other wastes solely for the purpose of generating a mixture whose POP content is below the defined ‘low POP content’ is normally environmentally unsound. Cases may exist, however, where mixing of wastes before destruction may be the environmentally preferred option”

#### Paragraph 123

What is meant by “gaseous solution”? Delete “gaseous” and replace by “gases”. What is meant by “liquid solution”? Delete “liquid solution” and replace by “liquids”.

#### Paragraph 124

It is unclear what is meant by the third sentence “In comparison ... discharge criteria”. This seems to be a sweeping claim without reference to any data or evidence. Delete this sentence.

#### Paragraph 127

Replace “caustic” by “alkali”. There does not appear to be any reason why the alkali used to neutralise a low pH waste should necessarily be caustic soda (or caustic potash).

#### Paragraph 130

It could also usefully be mentioned that solvent washing is a viable method for extracting hazardous wastes from the absorbent / adsorbent materials used in absorption / adsorption techniques (see §§130-131). Add new final paragraph:

“Solvent washing may often be a useful method for extracting hazardous wastes from the adsorbent or absorbent materials used in adsorption / absorption pre-treatment techniques (see §§123-124 above).

### 5.9 Environmentally sound destruction and disposal: Destruction and irreversible transformation methods

#### 5.9.1 General Comments

The present draft correctly indicates that OEWG-3 agreed to include the list of considerations presented by Greenpeace – but fails to acknowledge that OEWG-3 further agreed to combine this with the list of considerations already presented by WCC. The WCC list included some of the items on the Greenpeace list and also included a number of crucial items relating to intellectual property and to the state of commercialisation of the various technologies.

The types of items in the two lists are as follows:

- technical process items e.g. destruction efficiency, chemical topics, ancillary technologies, mobility (Greenpeace – WCC supports)
- items concerning inputs e.g. energy and raw materials (Greenpeace and WCC)
- items concerning outputs e.g. residues and their fate (WCC)
- economic considerations (Greenpeace and WCC)

- health and safety considerations (Greenpeace – WCC supports)
- intellectual property considerations (WCC)
- state of commercialisation (WCC)

Greenpeace also suggested two further types of consideration that, we understand, were not seen by the contact group at OEWG-3 as appropriate for inclusion, viz. regulatory infrastructure and community / stakeholder acceptability. WCC believes that the regulatory issues are adequately covered elsewhere in the Guideline (in particular in Section 4.2) and do not require reiteration in this section. WCC further agrees with the Contact Group that issues around “community acceptability” and “stakeholder acceptability” are highly subjective, open to lobbying – whether by industry or NGOs – and do not belong in these technical guidelines.

In support of the items requested by WCC (and, we thought, agreed by the contact group at OEWG-3) we would point out that:

a. Verification of manufacturers' / licensors' claims

This is the core section of the entire guideline and merits very careful analysis and verification against actual practical experience as opposed to manufacturers' or licensors' claims. The section could usefully make use of a wider range of sources. One examples of a source that appears not to have been consulted (because statements are made that are at variance with these sources) is: UNIDO – Demonstration of viability and removal of barriers that impede adoption and effective implementation of available non-combustion technologies for destroying persistent organic pollutants (a whole series of documents from the Technical Advisory Group to UNIDO). WCC does not necessarily endorse any of the information from UNIDO, but believes that it forms an important contribution to the corpus of information on the topic of destruction methods for POPs and merits critical analysis alongside other sources.

In addition, WCC believes that in the interests of transparency all claims made about the various technologies should be capable of independent verification. This implies, as a minimum, that for each technology there is either a clear statement of, or adequate references to documentation providing, the following information:

- Examples of commercially operating plants and their location.
- How long these plants have been in continuous operation.
- Their actual operating (as opposed to design) capacity.
- Their destruction and removal efficiency (DRE) measured across the entire system with a clear statement of the POPs concentration in the input waste stream to which this applies.
- Their consumption of utilities (water, energy).
- The types of waste (chemical nature, physical form, concentration) for which they have been proven in practice.
- The nature of any residues and their fate, e.g. techniques for disposal of residues.
- The nature of any pollution abatement measures that are required in operation.
- The costs per tonne of waste and/or per tonne of POP, with an indication as to whether there is potential for this to reduce as the technology matures.
- The nature (and costs) of any intellectual property rights (e.g. licences under patents) required.

Where this information is not available, it would be sensible to conclude that the technology is not yet really commercialised (see point (b) below), as any purchaser of the technology would need all of this information (and more) before proceeding.

b. State of commercialisation

Some technologies are described as commercialised on the strength of a single recently operating medium-scale plant, while others have numerous full-scale plants that have been in operation over

considerable periods of time in many countries. Some further qualitative distinction needs to be made between new and well-established technologies – both because of the implications for reliable and safe operation, and because any cost comparisons will be weighted against new technologies that have not yet progressed down the techno-economic 'learning curve'.

c. Intellectual property rights and their implications

Several of the technologies discussed appear to have a single (i.e. monopoly) supplier who holds intellectual property rights (e.g. patents) and would wish to license the technology. It is important for governments to know whether there is competition (and thus some measure of market control of prices) between technology suppliers, and whether (and on what terms and at what cost) licences are required.

**As a synthesis of the lists provided by Greenpeace and by WCC** we offer the following combined list (with some simplification and re-ordered to group items as logically as possible):

Technical considerations relating to the process itself

- Chemical and physical characterisation of the technology.
- Physical and chemical types of POPs wastes that may be treated.
- Concentrations of POPs in wastes that may be treated.
- Destruction efficiency (or destruction and removal efficiency) measured across the entire system, with a clear statement of the types of POPs and the POPs input concentration(s) to which this applies.
- Throughput achievable – actual operating (as opposed to “design”) capacity.
- Portability / mobility.

Considerations with regard to process inputs

- Raw material and catalyst requirements and availability.
- Utility requirements (including water, steam, energy, etc.) and availability.

Considerations with regard to process outputs

- Nature of any residues.
- Fate, e.g. ancillary techniques for containment, treatment and disposal of residues.
- Pollution abatement measures required.

Health and safety aspects

- Occupational (worker) health and safety.
- Community health and safety.

State of commercialisation

- Examples of commercial scale plants in operation, including
  - Their location and achieved operating capacity.
  - The length of time over which they have been in commercial scale operation.
  - Any significant problems encountered.

Intellectual property issues

- Number of independent suppliers of the technology and of any unique catalysts, etc.
- Nature of any existing intellectual property rights, including
  - Patents, coverage, conditions and requirements of any licences to operate.
  - Availability of technology transfer arrangements, in particular for developing countries.

## Economic issues

- Typical capital costs vs. operating capacity (at least an indication of order of magnitude).
- Typical operating costs vs. operating capacity (at least an indication of order of magnitude).
- Other costs, e.g. of licences to operate.

### 5.9.2 Additional preambular material

#### Paragraph 132 *bis*

Insert a new paragraph as part of the chapeau to this sub-section to cover some of the general points that apply to all of the listed techniques, *viz.*

“All of the listed techniques require skilled personnel and must be designed, built, operated and maintained to a high standard. Regular maintenance, reliable control procedures (including appropriate monitoring and analytical procedures) are required. A reliable supply of the requisite utilities (e.g. water, electricity or other fuel, chemicals specifically required for the process itself or for ancillary treatment or pre-treatment technologies) is essential. These considerations are particularly important when these techniques are used for the disposal of hazardous wastes, such as POPs wastes.

All of the techniques have the potential for the release of POPs to the environment if these conditions are not met or if used for wastes inappropriate in concentration, physical or chemical form to the technique. Equally, all of these techniques have the potential to meet the specified destruction efficiencies and can be considered for the specific types of waste mentioned for the individual techniques.”

The insertion of such a paragraph in the chapeau of the destruction section removes the need for repetition in the sub-sections on each individual technology, e.g. where it is currently misplaced in paragraph 144 as if applicable only to one particular technology.

### 5.9.3 Base-catalysed decomposition: Paragraphs 133 to 135

#### Heading

Replace “**Base-catalysed**” by “**Base-mediated**”.

While the technology described is conventionally known as “Base-catalysed Decomposition” (BCD), we understand that the “proprietary catalyst” is in fact gradually consumed in the process and requires replenishment. This does not conform to the accepted definition of a “catalyst” as a substance that changes the kinetics of, but is not consumed in, a chemical reaction.

#### Paragraph 133

- a. BCD cannot treat solids (or soils) directly (cf. UNIDO assessment). It is true that solid wastes can, depending on the waste matrix, be pre-treated (e.g. by shredding, screening, etc.) – this is correctly stated in the final sentence of the paragraph. In the first sentence replace “**liquid and solid**” by “**liquid**”.
- b. UNIDO agrees that the process has been commercialised and has promise for certain waste streams. The UNIDO Task Group has, however, asked the (sole) technology provider to supply details on:
  - Chemical characterisation and details of the reactions involved.
  - Quantities of mineral oils used in pre-treatment and destruction phases of the system, and the methods of disposal of residual oils.
  - Materials balance, including all inputs and reaction products.
  - Detailed assessment of destruction efficiencies, taking into account all releases and products.
  - Nature of systems required to ensure no releases of contaminated material via reaction products – including chemicals, water and salts.

- Risk of forming and releasing other chemicals of concern not yet included in monitoring regimes.
- Breakdown of costs and clarification of whether pre-treatment and waste stream monitoring and treatment are included in costs so far provided.

Further amendment of the text may be necessary in the light of the UNIDO assessment (or in the light of its absence, if it is not yet available).

- c. Delete the word “**atomic**” in the second sentence. This is factually incorrect. It could be replaced by the word “**nascent**” although this may be a little old-fashioned.

#### Paragraph 134

- a. It is agreed that this is a proven and commercialised technology for PCB wastes – less is known about its suitability for pesticide wastes and some examples of its use for these should be provided.
- b. Delete the sentence “**As mentioned above, both liquids and solids can be treated.**” It is not correct (see above) and in any case is repetitious.
- c. In the final sentence it would be useful to define what is meant by “higher” concentration. For example, it is believed that the process can only treat pure (100%) PCB so slowly as to be perhaps impractical.

#### Paragraph 134 *bis*

It should also be clearly stated that this is a proprietary technology requiring supplies of proprietary “catalyst” (or perhaps reagent). As there appears to be only a single (i.e. monopoly supplier) who seeks to license the technology, a number of additional questions need to be addressed, e.g.

- What is the magnitude of the licence fees involved?
- What terms and conditions attach to the negotiation of an operating licence?
- Can ongoing supplies of the “proprietary catalyst” be guaranteed?
- For how long is the intellectual property protected by patents, and in which territories?
- Is there any prospect of cost reduction as and when there is competition in the market for this technology?

Add appropriate text to cover these points, according to the information that is available. As a minimum, insert the following new paragraph:

“At present this technology is available only from a single supplier. It is protected in some territories by patents and licences are required from the sole supplier to operate in these territories. It is understood, however, that the supplier has indicated willingness to discuss conditions for technology transfer to developing countries.”

#### Paragraph 135

- a. While it is accepted that improvements have been made that significantly reduce PCDD/PCDF emissions from PCB waste treatment, it is believed that residual concentrations in off-gas are still at least 10 ng/m<sup>3</sup>. It is agreed that this can be dealt with by off-gas scrubbing, but details should be provided as to the nature of the solid waste from the scrubbers and the recommended means of disposal.
- b. WCC understands that there have been difficulties (including a fire) in the operation of one BCD unit (in Sydney, Australia) but is unclear as to the reasons and whether this has more general implications for the technology. It seems likely that there is significant risk to workers and the environment associated with early versions of the technology. While it is accepted that these difficulties may have been resolved in later revisions of the technology, this needs to be made clear to avoid the use and transfer of earlier and riskier variants, especially where developing countries are concerned that may not have the same capabilities for process monitoring and control. The bodies

of the Basel Convention carry the responsibility to avoid providing advice in these guidelines that might result in harm to people or the environment.

- c. Delete the final sentence of the paragraph and replace by a new paragraph (135 *bis*, see below) to separate the conclusion from the rest of the text.

#### Paragraph 135 *bis*

Insert new paragraph to read as follows:

“Although proprietary and available only from a single supplier, this technology could be recommended for use in all areas for low- and medium-concentration POPs wastes as liquids or, in some cases and after appropriate pre-treatment, solids.”

#### 5.9.4 Cement kiln co-incineration: Paragraphs 136 to 138

##### Paragraph 136

- a. Properly designed and operated cement kiln co-incineration usually results in a destruction efficiency of 99.9999% the word “most” is inconsistent with the text used in relation to other technologies (even some with lower DEs).

In the second sentence replace “destroying most POPs” by “destroying the POPs”.

- b. The comments on chlorine content are incomplete and, as a result, misleading. Add two new final sentences:

“In some cement manufacturing processes a certain amount of chlorine is required in the raw materials. In such cases the kiln operation can actually benefit from the addition of chlorine-containing POPs wastes that can supplement the raw material inputs.”

##### Paragraph 137

The destruction efficiency in a properly designed and operated cement kiln is 99.9999%.

The final sentence in paragraph 138 is wrongly placed (see below). Remove this sentence from paragraph 138 and insert it here where it belongs, as follows:

Replace the first sentence by the following text for proper comparison with statements made about other technologies:

“Cement kilns are listed in Part II of Annex C of the Stockholm Convention as a source category with the potential for comparatively high formation and release of unintentional POPs to the environment. This is true for some older kilns that are inappropriately designed and/or managed. However, numerous trials in the USA, France and elsewhere have demonstrated destruction efficiencies of up to 99.9999%. These levels are reached in practice in well-operated modern kilns. Such kilns can (and in many countries must) meet the most stringent regulatory emission limits (e.g. <0.1 ng/m<sup>3</sup> TEQ for dioxins/furans).”

##### Paragraph 138

- c. While the new final sentence is correct, it is positioned in a misleading manner as if it were the final conclusion. Delete the final sentence and insert it in paragraph 137 above where the issue of destruction efficiency is dealt with and where it can be seen in context. (See above).
- d. Delete the penultimate sentence of the paragraph and replace by a new paragraph (138 *bis*, see below) to separate the conclusion from the rest of the text.

#### Paragraph 138 *bis*

Insert new paragraph to read as follows:

“The technology is widely commercially available. High destruction efficiencies can be achieved as well as compliance with the most stringent current regulatory emissions control limits. However, it should be noted that this applies only to well-designed and well-operated modern kilns with adequate process management and control (e.g. temperature and residence time). It can be recommended for high and low POPs waste destruction in the described matrices and in all areas.”

## 5.9.5 Gas phase chemical reduction: Paragraphs 139 to 141

### Paragraph 139

- a. The temperature of 850°C cited is very low and could not be termed “high temperature” in terms of normal parlance for waste destruction technologies. It is understood that this temperature was used by the plant that formerly operated in Kiwana, Australia, and that this resulted in unacceptable levels of dioxin/furan emissions and the subsequent closure of the plant. It is understood, however, that more recently the technology has been substantially improved – including, crucially, operation at higher temperatures. In the first sentence replace “**approx. 850°C**” by “**at least 950°C**”. Add a new second sentence to read: “**It is important not to operate at lower temperatures as this may result in unacceptable levels of emissions of unintentional POPs such as dioxins and furans.**”
- b. As the production of methane does not occur until the process is running, there is no methane available for conversion back to hydrogen until the process has started up using external hydrogen. This has implications in terms of the requirement for the supply and storage of at least some compressed hydrogen cylinders. In the penultimate sentence: replace “**The process can operate without any external hydrogen supply**” by “**Once started up, the process can operate without any external hydrogen supply**”.

### Paragraph 140

- a. It is agreed that this is a proven and commercialised technology for most POPs wastes.
- b. It should, however, be clearly stated that this is a proprietary technology. As there appears to be only a single (i.e. monopoly supplier) who seeks to license the technology, a number of additional questions need to be addressed, e.g.
  - What is the magnitude of the licence fees involved?
  - What terms and conditions attach to the negotiation of an operating licence?
  - For how long is the intellectual property protected by patents, and in which territories?
  - Is there any prospect of cost reduction as and when there is competition in the market for this technology?
- c. In the second sentence replace “**Kwinana**” by “**Kiwana**”.

### Paragraph 141

Delete the final sentence of the paragraph and replace by a new paragraph (141 *bis*, see below) to separate the conclusion from the rest of the text.

### Paragraph 141 *bis*

Insert new paragraph to read as follows:

“**Although proprietary and available only from a single supplier, this technology can be recommended for the destruction of high and low concentration POPs in the described matrices, in both industrialised and less-industrialised regions.**”

## 5.9.6 Hazardous Waste Incineration: Paragraphs 142 to 147

### Fixed incinerators

WCC generally supports the comments on this section made at OEWG-3 by the Netherlands and the USA. WCC also agrees that the sections on large-scale and small-scale incinerators should be merged.

We also note that the draft BAT guidance document on hazardous (and municipal) waste incineration prepared under by the Expert Group on BAT/BEP under the Stockholm Convention for hazardous waste incineration is available at

[http://www.pops.int/documents/meetings/bat\\_bep/2nd\\_session/egb2\\_followup/draftguide/5A1municipa/hazwastedraft.pdf](http://www.pops.int/documents/meetings/bat_bep/2nd_session/egb2_followup/draftguide/5A1municipa/hazwastedraft.pdf)

This document represents the outcome of a major study by various experts including *inter alia* experts from the EC, the USA, Germany, Finland, Japan, UNEP, UNIDO, the industry sector and Greenpeace. It is itself based in part on a recent (March 2004) and even more detailed draft document, viz. the BAT Reference Document (BREF) produced by the European Integrated Pollution Prevention and Control (IPPC) Bureau as part of the work done by the EC in the context of the European IPPC Directive. It is important that the work done by the Basel Convention for the Stockholm Convention is consistent with the work done under the Stockholm Convention itself. While the present guideline can only include the briefest of summaries on the (very large) topic of hazardous waste incineration, the text used here should be based on the Stockholm BAT/BEP document.

In the light of the availability of the above key references, the entire section on hazardous waste incineration would benefit for being rewritten. The following comments relate to some specific points in the present draft of the Basel guidelines.

#### Paragraph 142

- a. We are not aware of any large-scale fixed incinerators using electrical energy as the primary fuel source. In the first sentence, replace "fuel combustion or electrical input" by "fuel combustion".
- b. The cited lower end of the temperature range (760°C) is far too low for proper operation. Incinerators operated at such low temperatures are completely unsuitable for the treatment of wastes containing POPs and are a reason for much of the adverse public reaction to the incineration concept. Replace "760°C" by "950°C".
- c. In the third sentence replace "nitrite" by "nitrogen".
- d. Delete "and ammonia (from nitrogen-containing wastes)" as any ammonia will itself be burnt (i.e. oxidised) at the high operating temperature.
- e. Delete "HCB, PCB, PCDD and PCDF" as these substances are not produced in modern correctly designed and operated incinerators. Even where trace quantities arise during the process they are destroyed within the incinerator with a destruction efficiency of 99.9999%. Other technologies (e.g. gas phase chemical reduction) also have the potential to produce PCDDs and PCDFs if incorrectly operated – although, quite properly, these substances have not been listed as products of those processes. For purposes of consistency, the same terminology should be used for all of the processes discussed and compared. Where destruction efficiencies are as high as 99.9999%, it is misleading to cite trace production of substances as "products". For all processes, there should be a clear – and comparable – statement of destruction efficiency (and where appropriate of "destruction and removal efficiency" across the operating system). For all processes, the discussion should be of the performance of the technology when designed and operated to current standards. Throughout this document we should be comparing "like with like" to allow an objective comparison of the advantages and disadvantages of the various options.
- f. Insert a new sentence taken from paragraph 144 below after the present third sentence (ending "...control of the incineration operations."): "Where input wastes may be contaminated with heavy metals, in particular mercury, or other relatively volatile substances, e.g. iodine, there may be a need for specialised post-treatment of gaseous emissions."

#### Paragraph 143

- a. The destruction efficiency in a properly designed and operated hazardous waste incinerator is at least 99.9999%. The first sentence in paragraph 144 is wrongly placed (see below). Remove this sentence from paragraph 144 and insert it here where it belongs, i.e. replace the first sentence by the following text for proper comparison with statements made about other technologies:

"Waste incinerators are listed in Part II of Annex C of the Stockholm Convention as a source category with the potential for comparatively high formation and release of unintentional POPs to the environment. This is true for some older incinerators, particularly those for burning municipal or medical waste rather than hazardous wastes, that were inappropriately designed and/or managed. However, numerous trials in the USA, France and elsewhere have demonstrated destruction efficiencies for hazardous waste incinerators of 99.9999% or better. These levels are reached in practice in well-operated modern hazardous waste incinerators. Such incinerators can (and in many

countries must) meet the most stringent regulatory emission limits (e.g. <0.1 ng/m<sup>3</sup> TEQ for dioxins/furans)."

- b. In the second sentence replace "the reported destruction efficiency of this process is over 99.99%" by "the reported destruction efficiency of well-designed and well-operated incinerators over 99.9999% and this is often required by regulation and permits. Such units can meet the most stringent current regulatory emissions control limits (e.g. <0.1 ng/m<sup>3</sup> TEQ for dioxins/furans)" to reflect the performance of units designed and operated to current standards and meeting current regulatory requirements.

It should also be noted in the text that:

- Incineration technology is currently the most widely used method for the destruction of POPs.
  - Emissions standards for incineration are widely regulated at very low levels (e.g. in the European Union the emission standards for all waste incinerators, including hazardous waste incinerators, are set at <0.1 ng/m<sup>3</sup> TEQ for dioxins/furans.
  - Actual achieved operating emission levels for most European hazardous waste incinerators are now <0.01 ng/m<sup>3</sup> TEQ for dioxins/furans – often much lower.
  - In the fourth sentence replace "all types of POPs waste" by "all types of POPs waste, including pure POPs" to reflect the fact that this is one of the few currently commercialised technologies capable of handling 100% POPs solids and liquids.
- c. In the last sentence add at the end ", although up to 1 te/hr of such wastes can be handled by injection into the post-combustion chamber".

#### Paragraph 144

- a. While the new first sentence is correct, it is positioned in a misleading manner as if it were the final conclusion. Delete the first sentence and insert it in paragraph 143 above where the issue of destruction efficiency is dealt with and where it can be seen in context. (See above).
- b. While the new third sentence is correct, it is also positioned out of context. Delete this sentence and insert it in paragraph 142 above where the issue of hazardous emissions is dealt with and where it can be seen in context. (See above).
- c. The next four sentences in this paragraph ("These incinerators ... residues (ash, etc).") make points that, while more or less valid, apply to all of the technologies. These caveats should not be positioned as if they were disadvantages specific to this one technology among several. Delete these four sentences and insert them as part of a more general paragraph in the chapeau to the entire section on destruction technologies (see above – paragraph 132 *bis*).
- d. Delete the final sentence of the paragraph and replace by a new paragraph (144 *bis*, see below) to separate the conclusion from the rest of the text.

#### Paragraph 144 *bis*

Insert new paragraph to read as follows:

"The technology is widely commercially available and is currently the most mature and widely used technology for the destruction of POPs wastes. High destruction efficiencies can be achieved as well as compliance with the most stringent current regulatory emissions control limits. However, it should be noted that this applies only to well-designed and well-operated modern kilns with adequate process management and control (e.g. temperature and residence time). It can be recommended for high and low POPs waste destruction in the appropriate matrices and in all areas."

#### Mobile incinerators

#### Paragraph 145

Add at the end of the sentence ", which can operate to the same high efficiency (> 99.9999%) as large-scale fixed incinerators."

## Paragraph 146

- a. The destruction efficiency in a properly designed and operated mobile hazardous waste incinerator is at least 99.9999%. The final sentence in paragraph 147 is wrongly placed (see below). Remove this sentence from paragraph 147 and insert it here where it belongs, i.e. replace the second sentence by the following text for proper comparison with statements made about other technologies:

“Waste incinerators are listed in Part II of Annex C of the Stockholm Convention as a source category with the potential for comparatively high formation and release of unintentional POPs to the environment. This is true for some older incinerators, particularly those for burning municipal or medical waste rather than hazardous wastes, that were inappropriately designed and/or managed. However, numerous trials have shown that properly designed and operated mobile hazardous waste incinerators can achieve destruction efficiencies of 99.9999% or better and can meet the most stringent current regulatory emission control requirements.”

- b. Unlike large-scale fixed incinerators, mobile incinerators cannot reliably treat aqueous solutions because of the smaller size of the post-combustion chamber, therefore in the penultimate sentence delete “aqueous solutions”.
- c. In the final sentence, replace “It is ...” with “They are ...”.

## Paragraph 147

- a. In the first sentence replace “large quantities of fresh water” by “fresh water”. The requirement for water is no greater than that of other technologies.
- b. In the first sentence replace “large quantities of chemicals” by “chemicals” as the amounts required are little more than stoichiometric, not necessarily large at all and no different to the requirements for chemicals for several of the other discussed technologies that also require off-gas scrubbing.
- c. Delete the sentence “There may be limits ... that can be incinerated”. This is pure speculation. There is no knowledge of what limits, if any, may exist and no *prima facie* reason for such a limitation on the technology.
- d. Delete the sentence “Nonetheless ... case-by-case basis”. A case-by-case review of the applicability of any technology is required. This is one of the reasons for developing this guideline and is not specific to mobile incineration (or any other) technology.
- e. While the new final sentence is correct, it is positioned in a misleading manner as if it were the final conclusion. Delete the final sentence and insert it in paragraph 146 above where the issue of destruction efficiency is dealt with and where it can be seen in context. (See above).

## Paragraph 147 bis

Insert a new paragraph that draws the conclusion (as for the other technologies), viz.

“The technology is widely commercially available. High destruction efficiencies can be achieved as well as compliance with the stringent current regulatory emissions control limits. However, it should be noted that this applies only to well-designed and well-operated modern mobile incinerators with adequate process management and control (e.g. temperature and residence time). It can be recommended for high and low POPs waste destruction in the appropriate matrices and in all areas.”

## 5.9.7 Mediated electro-chemical oxidation (MEO): Paragraphs 148 to 150

### Paragraph 148

**Delete the final sentence.** The statement made, while true, is absolutely general to any technology and is not a specific advantage of MEO. It is in fact no more than definition of the adjective “proper” as applied to post-treatment.

### Paragraph 149

Note that UNIDO has at present excluded MEO from its short list of non-combustion technologies because of limited commercial experience with the technique. It might be sensible to make sure that the statement about commercial availability can be justified.

In the last sentence, delete “halogens”, as the “Silver II” version (at least) of the technology has been successfully used on a variety of halogenated substrates, including PCBs and chemical warfare agents.

Add new final sentence:

“The ‘Silver II’ version of the technology has been successfully used on a variety of halogenated substrates, including PCBs and chemical warfare agents.”

#### Paragraph 150

In the last sentence, replace “low concentration POP waste destruction” by “the destruction of POPs wastes in low to medium quantities at low to medium concentrations”. The constraint at present appears to be as much one of scale of operation as of POPs concentration.

#### 5.9.8 Molten salt oxidation (MSO): Paragraphs 151 to 153

Some doubt was expressed at OEWG-3 as to the commercial status of this technology. UNIDO does not consider this technology in its short-list of non-combustion technologies. It is questionable whether this is really commercial in the context of POPs wastes. The sole technology provider is understood to be the Lawrence Livermore National Laboratory in the USA (which makes it sound a bit experimental) and the US delegation at OEWG-3 did not appear to have further information. It would seem sensible to check whether this technology is really commercially available before including it in the final draft.

Consider deletion of paragraphs 151-153 unless more convincing evidence becomes available as to its commercial availability and acceptable performance for the destruction of POPs.

#### 5.9.9 Plasma arc decomposition: Paragraphs 154 to 160

##### Paragraph 154bis

The commercial status of this technology is not entirely clear.

Insert a new paragraph 154bis with the text: “Plasma arc technology is not widely used because of high operating costs and high energy requirements. It has been developed principally for the treatment of nuclear, rather than chemical, wastes. While it is promoted, for example in the former Soviet Union, where suitable equipment is available and spare capacity now exists it is unlikely to be of wide commercial applicability. Thus, for example, there is no commercial plant operating for waste treatment anywhere in Western Europe.”

##### Paragraphs 155 to 157

Delete these paragraphs relating to the PACT process. Even if plasma arc technology is to be retained as a “commercially available” technique, this can only really apply to the “Plascon” process and not to the “PACT” process.

##### Paragraphs 158 to 160

There remains some doubt as to the commercial status even of the “Plascon” process. The sole technology provider appears to be based in Australia and perhaps Environment Australia could be asked to provide up-to-date information as to its commercial status and the achieved destruction efficiency?

##### Paragraph 159

The statement about destruction efficiency needs to be cross-checked, e.g. with Australia. If it is really only 99.0% then this technology would not appear to satisfy the destruction level criteria espoused by these guidelines.

#### 5.9.10 Sodium reduction: Paragraphs 161 to 163

##### Paragraph 162

Insert at the beginning of this paragraph new text reading: “Sodium reduction technology is in commercial use, but only for the *in situ* destruction of wastes containing PCBs. The only company in Europe that did experiment for some time with the technology has now stopped work, but it appears that pilot plants in the USA have now been scaled up.”

## Paragraph 162 *bis*

Metallic sodium presents very serious operational hazards – corrosion, fire and explosion. The health and safety aspects must be addressed in the guideline; to fail to do so would be the height of irresponsibility, particularly given the likelihood that the guideline will be used primarily in developing countries.

Add new paragraph reading: “Dispersed metallic sodium can react violently and explosively with water, presenting a major hazard to operators. The sodium can also react with a variety of other substances to produce hydrogen – a flammable gas that is explosive in admixture with air. Great care must be taken in process design and operation to absolutely exclude water (and certain other substances, e.g. alcohols) from the waste and from any other contact with the sodium”.

## Paragraph 163

At the end of the first sentence add, “, and there is no quantitative information on destruction efficiency” – unless, of course, some such information can be found. It seems inappropriate to be proposing the use of a technology if we simply do not know whether it can meet the destruction level criteria we are suggesting.

### 5.9.11 Super-critical water oxidation (SCWO): Paragraphs 164 to 166

OEWG-3 expressed some doubts as to the commercial availability of this technology. Although a plant has begun operation in Japan, it is not clear whether this is on a commercial basis. The Japanese delegation at OEWG-3 was unable to provide further information and should be contacted to see whether they can provide any update. The UNIDO Task Force concluded (in September 2003) that this technology “had not yet reached a sufficient level of commercial maturity to enable further consideration”.

Consider deletion of paragraphs 164 to 166. If they are retained then the following comments apply:

#### Paragraphs 165 and 166

The problem with this technology is the need for a highly corrosion-resistant reactor. Even with a titanium reactor (very costly) there is a significant corrosion problem if halogens (e.g. chlorine) are present.

Although the technology has been tested with chlordane and PCB, there is reason to believe that it may not be suitable except at (very?) low concentrations if the POP material is halogenated (as are all of the present POPs). The figure of 20% organic content is almost certainly (far?) too high for chlorinated organics. In trials with a somewhat similar technology (“high pressure wet oxidation”), the upper limit for chlorine content in the waste was only 50 ppm (and for fluorine just 1 ppm).

In paragraph 165, add at the end “The upper limit for organic content may be far below 20% for chlorinated organic materials; this is a matter for concern as all present POPs contain chlorine.”

In paragraph 166, replace the final sentence with the following: “Because of the major problem of corrosion identified with wastes containing chlorinated organic materials, this technology cannot be recommended for use with POPs.”

### 5.9.12 Recommendations: Table 1

In view of the major discrepancies in the text as described in the preceding comments in this section, the present Table requires major revision and should be replaced by the table below. The table should also contain information on costs and on intellectual property rights (including considerations of monopoly supply, and the availability and cost of licences).

Footnotes 1 and 2 should be removed, as the considerations mentioned (i.e. good temperature control, proper treatment of off-gases and other by-products) apply without exception to all technologies and are not in any way specific to incineration.

For the reasons explained in the preceding sections, certain technologies have been removed from this table to make it consistent with the text.



Paragraph 167

Table 1: Summary of Technologies that may be suitable for the Destruction or Irreversible Transformation of POPs Wastes

	Cost	Intellectual Property	High Concentration POPs Wastes										Low Concentration POPs Wastes									
			Industrial Areas					Non-industrial Areas					Industrial Areas					Non-industrial Areas				
			SI	Aq	SS	OO	Sd	SI	Aq	SS	OO	Sd	SI	Aq	SS	OO	Sd	SI	Aq	SS	OO	Sd
Base catalysed decomposition	?	Monopoly, licence required		4		4			4			4			4			4			4	
Cement-kiln co-incineration	?	No issues		4	4	4	4							4	4	4	4					
Gas-phase chemical reduction	?	Monopoly, licence required?	4		4	4	4	4 <sup>1</sup>		4 <sup>1</sup>	4 <sup>1</sup>	4 <sup>1</sup>	4		4	4	4	4 <sup>1</sup>		4 <sup>1</sup>	4 <sup>1</sup>	4 <sup>1</sup>
Fixed hazardous waste incinerators	?	No issues	4	4	4	4	4	4 <sup>2</sup>	4 <sup>2</sup>	4 <sup>2</sup>	4 <sup>2</sup>	4 <sup>2</sup>	4	4	4	4	4	4 <sup>2</sup>	4 <sup>2</sup>	4 <sup>2</sup>	4 <sup>2</sup>	4 <sup>2</sup>
Mobile incinerators	?	No issues	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Mediated electro-chemical oxidation	?	Proprietary, but several suppliers		?	?	?								4	4	4						
Plasma arc decomposition ("Plascon" process only)	?	Proprietary, licence required?	4		4	4	4															
Sodium reduction	?	?				4										4						

Footnotes:

1. Only small-scale gas-phase chemical reduction plants are likely to be suitable for non-industrial areas; the technology as currently developed is better suited to industrial areas.
2. Only small-scale fixed hazardous waste incinerators are likely to be suitable for non-industrial areas; large-scale fixed hazardous waste incinerators are better suited to industrial areas.

Key:

SI = soils  
Aq = aqueous solutions  
SS = sediments / sludge  
OO = oils and other organic liquids  
Sd - solids

### **5.10 Other disposal methods when destruction or irreversible transformation does not represent the environmentally preferable option**

Text to be relocated from former section 3.3.3 and rewritten – comments reserved until text is available.

### **5.11 Other disposal methods when the POPs content is low**

#### **Paragraph 171**

The fourth bullet does not appear to be very logical and **should be deleted**. If the residue has been demonstrated to be non-hazardous, why should it be sent to a hazardous waste landfill?

#### **Paragraph 175**

Add a fourth bullet: "leachate tests should be performed, as appropriate, to confirm that the immobilisation is adequate for purpose."

### **5.12 Remediation of contaminated sites**

No comments at this time – it is assumed that the section will be condensed and updated as per comments at OEWG-3.

### **5.13 Health and Safety**

#### **Paragraph 188**

At the end of the chapeau replace "include" by "may include". Some of the listed situations are by no means necessarily high concentration, high volume or high risk. A case-by-case approach is more appropriate within the broad categories described. This applies, for example, to pesticide application (not all pesticides, not all applications), handling for transport, etc. A "blanket" approach risks insufficient attention to the real high-risk situations.

In the third bullet, replace "whether the POP chemical is being produced intentionally or unintentionally" by "where the POP chemical is being produced intentionally". There is no *prima facie* reason to consider an area where trace quantities of a POP may be produced unintentionally as potentially high concentration, high volume or high risk.

#### **Paragraph 189**

At the end of the chapeau, delete "some examples of" and replace "include" by "may include". (See the comment on the preceding paragraph).

**Delete the final bullet.** It is risky to assume that such cases are low risk – again a case-by-case approach would be more appropriate.

### **5.14 Emergency response**

#### **Paragraph 189**

Add a further bullet: "alignment with relevant local and national regulations governing emergency planning and response."

### **5.15 Public participation**

WCC still doubts whether this section is appropriate in the present technical guideline, even though it is clearly an important topic. As it is to be retained, it needs further editing, e.g. by the Interim Secretariat to the Stockholm Convention, to ensure that it adheres to the wording of the Convention – although the present draft is an improvement over earlier versions.

## **6. APPENDIX 1: INTERNATIONAL INSTRUMENTS AND NATIONAL LEGISLATION**

No comments, but text needs to be completed.

## 7. APPENDIX 2: BIBLIOGRAPHY

Needs further work. In particular, as UNIDO has a major project on “available non-combustion POPs destruction technologies”, it is surprising that there is not a single reference to this work. At OEWG-2 and OEWG-3, Denmark also mentioned a somewhat similar study under Danish sponsorship (by DANCEE?); this should also be referenced if available in time.

References to more detailed information sources on individual technologies, e.g. data sheets, could be provided.