Addendum to the risk profile of Pentachlorobenzene

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1 INTRODUCTION

This report is an addendum to the report ‘Pentachlorobenzene; Dossier prepared for the third meeting of the UN-ECE Ad hoc Expert Group on POPs’ (Van de Plassche et al 2002), further referred to as original report. This original report on Pentachlorobenzene (PeCB) was first sent in by the Netherlands d.d. 19 November 2003 when it submitted PeCB for inclusion into the POP Protocol. Somewhat later the Dutch submission was suspended for consideration on request of the Netherlands and on the 9th of September 2005 the Netherlands withdrew its submission. In the meantime the EC and the EU member states agreed to submit PeCB for inclusion into the annexes of the POP Protocol. On the 12th of September 2005 PeCB was officially submitted again by the EC and the EU member states that are Party to the POP Protocol. The original report on PeCB was sent in at the same time to support the proposal. As this report was published in 2002, new information may have become available since that is important for the evaluation of PeCB. Thus, the aim of this addendum is to update the original report. Only new information published in the period 2002 – 2005 is presented in the addendum. This implies that the original report and addendum should be assessed together when evaluating the PeCB. To facilitate this process, the same lay-out as in the original report is followed, including the numbers of the tables.

2 CHEMICAL IDENTITY

No new information

3 POP CHARACTERISTICS

3.1 Potential for long-range atmospheric transport

Mantseva et al (2004) developed a multi-compartment transport model for the evaluation of long-range atmospheric transport and deposition of POPs. Based on this model assessment a transport distance in Europe of over 8000 km is calculated for PeCB.

PeCB was also actually detected in air samples collected in 2000 at the 40 sampling stations in North America (Canada, USA, Mexico, Belize and Costa Rica), including 5 arctic stations (Shen et al 2005). The air concentrations were almost uniform across North America (see section Environmental levels and bioavailability). According to the authors, this small spatial variability across the Northern Hemisphere indicates that PeCB has a very long atmospheric residence time, which allows it to become widely distributed in the global atmosphere (see chapter 5).

Conclusion: The new information confirms the conclusion in the original report (Van de Plassche et al 2002) that PeCB meets the criterion for long-range atmospheric transport.

3.2 Persistence

No new data.
3.3 **Bioaccumulation**

No new data

3.4 **Toxicity and Ecotoxicity**

No new data.

3.5 **Risk Profile - Conclusion**

The conclusion of the risk of pentachlorobenzene remains unchanged:

The POP characteristics of pentachlorobenzene meet the UN-ECE criterion, that is potential for long-range atmospheric transport, persistence (in water, sediment and soil), bioaccumulation and (eco)toxicity. The experimental data on which this conclusion is based are summarised in Table 3 of the original report (Van de Plassche et al 2002) and repeated below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Criterion-match (Yes/No)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential long-range atmospheric transport</td>
<td>Yes</td>
<td>Vapour Pressure: 2.2 Pa at 25°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Half-life in air: 277 d</td>
</tr>
<tr>
<td>Persistence in water, soil and sediment</td>
<td>Yes</td>
<td>Half-life in water: 194–1380 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Half-life in sediment &amp; soil: 103-345 d</td>
</tr>
<tr>
<td>Bioaccumulation</td>
<td>Yes</td>
<td>Log $K_{ow}$: 4.8 - 5.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BCF values &gt; 5,000 L/kg</td>
</tr>
<tr>
<td>Toxicity</td>
<td>Yes</td>
<td>(Sub)chronic: NOEL: 12.5 mg/kg bw</td>
</tr>
<tr>
<td>Ecotoxicity</td>
<td>Yes</td>
<td>Aquatic: $LC_{50}$: 250 µg/l (fish)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOEC: 10 µg/l (crustaceans)</td>
</tr>
</tbody>
</table>
4 EXTENT OF RELEASE TO THE ENVIRONMENT

4.1 Production

The Czech Republic states that for their country it is yet unclear whether PeCB is produced or used as a fungicide and flame retardant (Hlinova 2005).

4.2 Uses

No new information

4.3 Emissions and pathways to the environment

The calculated emission of PeCB in UNECE-Europe for the year 2000 was zero tonnes/year (Denier van der Gon et al 2005). This value is based on data from individual countries and expert estimates where detailed data are missing.

In the original report (Van de Plassche et al 2002) several indirect emission pathways are described, such as:

- impurity in quintozene and HCB;
- (municipal waste) incineration of organochlorine compounds and hydrocarbon polymers in the presence of chlorine;
- in waste streams from pulp and paper mills, iron and steel mills, petroleum refineries;
- and activated sludge waste water treatment and from landfills.

However, at that time quantitative data were not available. The Canadian report “Pentachlorobenzene (QCB) and tetrachlorobenzenes (TeCBs) proposed risk management strategy” from the Chemicals Control Branch Environmental Protection Service (EPS 2005) provides qualitative and quantitative information on emission sources of pentachlorobenzene in Canada. The following information in this paragraph is completely derived from this source.

In the Table 4.3 below an estimate of the releases to the Environment of PeCB in Canada in 2001 is described.

The following sources are additional emission sources compared to the original report (Van de Plassche et al 2002):
- barrel burning of household waste;
- wood treatment plants and in service utility poles;
- hazardous waste incineration;
- magnesium production;
- the use in pesticides other than quintozene (see "Pesticides" in the following paragraphs);
- and solvent use.

The use in dielectric fluids was described as an emission pathway in the report of 2002 that was not expected to cause emissions anymore. However in "Environmental Protection Service (2005)" it appears that at least in Canada PeCB emissions due to fluid spill and cleanup still occur (see also "Dielectric fluids in the following paragraphs").
Table 4.3. Estimate of Releases to the Environment of PeCB in Canada, 2001

<table>
<thead>
<tr>
<th>Sources</th>
<th>Releases (kg/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air</td>
</tr>
<tr>
<td>Barrel burning of household waste</td>
<td>1.814</td>
</tr>
<tr>
<td>Wood treatment plants and in service utility poles</td>
<td>2.24</td>
</tr>
<tr>
<td>Pesticide use</td>
<td></td>
</tr>
<tr>
<td>Dielectric Fluid spill and cleanup</td>
<td>0.001</td>
</tr>
<tr>
<td>Municipal solid waste incineration</td>
<td>0.364</td>
</tr>
<tr>
<td>Hazardous waste incineration</td>
<td>1.835</td>
</tr>
<tr>
<td>Magnesium production</td>
<td>1.449</td>
</tr>
<tr>
<td>Solvent use</td>
<td>0.037</td>
</tr>
<tr>
<td>Long-range transport</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

Source: 2001 Inventory and Technical Study (Cleghorn and Davies) as cited in Environmental Protection Service (2005)

The following paragraphs contain short descriptions of the emission sources as described in Table 4.3. The percentages in the text below correspond with the amounts as described in table 4.3.

**Barrel Burning of Household Waste**
A recent report issued by the Burn Barrel Subgroup of the Dioxins/Furans Workgroup of the Great Lakes Bi-national Toxics Strategy has identified that a portion of the municipal solid waste stream is burned on site at residential dwellings in rural areas. The US Environmental Protection Agency (US EPA) has studied emissions from barrel burning. Emission factors applied by A. J. Chandler (2004) cited in Environmental Protection Service (2005) show that barrel burning emits far larger amounts of chlorobenzenes, much of which is found in the ash, than incineration and could be a potentially significant source. The estimated releases from barrel burning represent 52% of the total annual releases of PeCB.

**Dielectric Fluids**
As identified by a 2001 Inventory and Technical Study (Cleghorn and Davies) cited in Environmental Protection Service (2005) trace amounts of PeCB are released to the environment when there are spills of dielectric fluids used for PCB transformers that contain these substances. Such spills would be expected to occur from in-use equipment as opposed to equipment in storage. Dielectric fluids that initially contained PCB products would have small amounts of PeCB. When all of the existing PCB equipment is taken out of service (scheduled for December 31, 2007 for equipment containing 500 mg/kg or more PCB and December 31, 2014 for equipment containing between 50 and 500 mg/kg, according to proposed draft regulations (Environment Canada, 2002)) the amounts released from spills will decrease to zero.

**Pesticides**
PeCB is used as a chemical intermediate in the production of pentachloronitrobenzene (also known as quintozene). Hexachlorobenzene, and thus PeCB, based on
assumptions by the U.S. Environmental Protection Agency (U.S. EPA 1999), has been cited by the U.S. EPA (1997), as cited in Environmental Protection Service (2005), as an impurity in quintozene, clopyralid, atrazine, chlorothalonil, dacthal, lindane, pentachlorophenols, picloram and simazine. None of these pesticides are produced in Canada. All but dacthal and lindane are currently registered for use in Canada under the Pest Control Products Act. Their use may result in the release of PeCB into the Canadian environment.

The Pest Management Regulatory Agency (PMRA) as cited in Environmental Protection Service (2005) has estimated that the release of PeCB for 2001 in Canada was approximately 6.2 kg, which represents approximately 15% of the total annual releases of PeCB. This value was calculated based on available sales and production data and the level of PeCB contamination in pesticides; as reported by the registrants; and the estimates of PeCB contamination in the cases when registrant data were not available. It was assumed that all PeCB contamination present in the technical grade active ingredients are transferred into end-use products, that all sales lead to use, and that all uses lead to entry into the environment. This estimate does not include releases of PeCB from wood treatment.

Recent efforts of manufacturers to reduce chlorobenzene contamination in pesticides should result in a reduction of these levels.

**Municipal Solid Waste Incineration**

According to the 2001 Inventory and Technical Study (Cleghorn and Davies) cited in Environmental Protection Service (2005) waste incineration was identified as a potentially significant source of chlorobenzenes. New data (Chandler, 2004) cited in Environmental Protection Service (2005) suggests that controlled municipal solid waste incineration is not a large source of chlorobenzenes releases in Canada. Emissions from controlled municipal solid waste in Canada are regulated by the provincial/territorial governments.

There are some situations (primarily in Newfoundland) where municipal solid waste is incinerated in uncontrolled conditions that would emit far larger amounts of chlorobenzenes than controlled incineration. It is estimated that municipal solid waste incineration contributes approximately 6% of the total annual release of PeCB.

**Hazardous Waste Incineration**

PeCB has been found in releases from hazardous waste incinerators and cement kilns burning waste-derived fuels. Recent investigation (Chandler 2004b) cited in Environmental Protection Service (2005) indicates that, given the temperatures achieved in the hazardous waste incinerator, there is no scientific or practical basis for suggesting that flow-through emissions of PeCB will occur. For the same reasons, any bottom ash residues leaving the incinerator are unlikely to contain PeCB since these compounds would volatilize into the gas stream if present in materials charged to the furnace. The only chlorobenzenes released from hazardous waste incineration would therefore come from their creation in the incineration process. It is estimated that PeCB releases from this source represent approximately 4% of the total annual release of PeCB.
Wood Treatment
The 2001 Inventory and Technical Study indicates that PeCB is contained in pentachlorophenol as an impurity. Pentachlorophenol is one of the five main wood treatment chemicals that are used in Canada, but it is not manufactured in Canada. In North America, the only currently registered uses for pentachlorophenol are for pressure and thermal treatment of railway ties, utility poles, pilings and outdoor construction materials. Releases from treatment plants include air emissions, which are generally localized, and releases to water and solid wastes in various forms. Treated wood, such as in-service posts and pilings, also releases PeCB while in use and once land filled. It is estimated that 2.34 kg/yr of PeCB are released from wood treatment plants and in service utility poles. This source represents approximately 6% of the total annual releases of PeCB.

Magnesium Production
The formation of chlorobenzenes is likely to occur during various metals production processes. The magnesium production process includes an electrolytic process which entails carbon and chlorine in contact with each other at high temperature during the electrolysis of magnesium chloride with graphitic electrodes involving the injection of gaseous hydrochloric acid. Releases of PeCB to air and water have been reported by the only magnesium plant in Canada using this process. Emission test data from this facility reported the release of 1.53 kg/yr of PeCB. This represents approximately 4% of the total annual releases of PeCB.

The Figure below gives a schematic overview of the PeCB releases in percentages of the total annual release of PeCB in Canada in 2001. These percentages correspond with the amounts in table 4.3.

Several other sources or potential sources were identified in the 2001 Inventory and Technical Study (Cleghorn and Davies). In some cases, the available data indicated that these sources contributed very little or insignificantly to the overall releases of PeCB. In other cases, data was too scarce to allow a conclusion. The following potential sources are identified:
- Chlorinated Solvents;
- Secondary Copper and Aluminium Processing;
- Chemical Manufacturing;
- Iron and Steel Mills;
- Petroleum Refineries;
- Wastewater Treatment Plants;
- Textile Mills;
- Long-Range Transport.
ENVIRONMENTAL LEVELS AND BIOAVAILABILITY

A reasonable amount of monitoring data for PeCB has been presented in the original report. Recently, also more data on remote regions has become available.

PeCB was detected in all air samples collected in 2000 at the 40 sampling stations in North America (Canada, USA, Mexico, Belize and Costa Rica), including 5 arctic stations (Shen et al 2005). The air concentrations are considered almost uniform across North America with an average concentration of 0.045 ng/m$^3$ and a range 0.017 – 0.138 ng/m$^3$. According to the authors, the small spatial variability across the Northern Hemisphere indicates that PeCB has a very long atmospheric residence time, which allows it to become widely distributed in the global atmosphere.

In Sweden PeCB was also detected in all 8 analyzed air samples (median 0.033 ng/m$^3$) and in both atmospheric deposition samples (max 0.16 ng/m$^2$.day) collected in the Stockholm area (Kaj and Palm 2004).

In all bottom sediments from harbours of northern Norway and the Kola Peninsula in the arctic, PeCB ranged from 2 - 5 µg/kg dry weight (n= 6, AMAP 2004). These concentrations are similar as detected in less remote areas in Sweden: PeCB was detected in 3 of the 20 freshwater sediment samples collected in 2002 in the Stockholm
area (Sternbeck et al 2003). The maximum concentration was 6 µg/kg dry weight. Also in another study, PeCB was detected in Swedish sediment samples (4 out of 6 samples, median 1 µg/kg dry weight) (Kaj and Palm 2004).

PeCB was detected in fish muscle collected in 2002 at Swedish marine and freshwater sites regarded as uncontaminated. Kaj and Dusan (2004) measured 2.2 ng PeCB/g lipid weight in herring from one location and maximum 16 ng PeCB/g lipid weight in perch from two different locations.

In the Netherlands, PeCB was detected in all 10 flounder liver samples collected in 1996, including from 2 relatively unpolluted reference locations (De Boer et al 2001). The highest concentration was 1100 µg/kg lw (280 µg/kg ww), and at the reference location 3 ng/g lw (0.64 ng/g ww). Also in 2003, PeCB was detected in 50% of the freshwater fish samples (eel and pike perch) in concentrations ranging between 1 – 10 ng/g ww (Van Leeuwen et al 2004).

PeCB was detected in different arctic species. Vorkamp et al (2004) analysed PeCB in biota from Greenland and measured the following concentrations:
- Ptarmigan liver approx 23 ng/g lw (1.5 ng/g ww);
- Kittiwake muscle approx 8 ng/g lw (1.1 ng/g ww);
- Musk ox blubber approx 0.32 ng/g lw (0.29 ng/g ww);
- Arctic char approx 3.9 ng/g lw (0.07 ng/g ww).

PeCB was also detected in all 15 plasma and fat samples of polar bear from the arctic Svalbard Islands with an average concentration of 7.9 and a maximum of 13.3 ng/g ww (Gabrielsen et al 2004). According to the authors, similar concentrations are observed in polar bears from Alaska, Canada and East-Greenland.

PeCB was detected in soils and mosses from coastal areas of Victoria Land (Antarctica) (Borghini et al 2005). Concentrations in the six mosses samples varied between 1-2.4 ng/g dw and in the four soil samples between 0.4 and 1.3 ng/g dw.

**Conclusion:** The presence of PeCB is widespread. PeCB is present in recently collected samples of air (widespread over northern hemisphere), atmospheric deposition (Sweden, Great Lakes), sediments and biota from locations regarded as uncontaminated and from remote areas (Sweden and Gulf of Gdansk), biota from the arctic and mosses from Antarctica. This is indirect evidence that PeCB is subject to long-range transport.

### 6 SOCIO-ECONOMIC FACTORS

#### 6.1 National and international regulation

##### 6.1.1 National regulation

**Canada**

The information in this paragraph on Canada is completely derived from the Canadian report “Pentachlorobenzene (QCB) and tetrachlorobenzenes (TeCBs) proposed risk
management strategy” from the Chemicals Control Branch Environmental Protection Service (EPS, 2005)

Releases to Water
The Canadian Council of Ministers of the Environment has established an interim chronic exposure water quality guideline for the protection of freshwater aquatic life of 0.006 mg/L for PeCB.

Barrel Burning
In several Canadian jurisdictions, a regulatory approach to either prohibit open burning, including backyard and barrel burning of household waste, or permit it only under pre-approved conditions has been adopted. Legislation is used at both the provincial and municipal levels. Nova Scotia’s Solid Waste Resource Management Regulations, 2002 include a ban on open burning of municipal solid waste, including open burning in an uncontrolled teepee, pit or silo burner. Several municipalities and regional districts in British Columbia have passed bylaws that completely prohibit backyard burning or limit burning to dry, garden refuse under strict rules. The government of British Columbia provides municipalities with a model municipal by-law (B.C. Ministry of Water, Land and Air Protection 1997) to regulate residential backyard burning.

Under the Binational Toxics Strategy for the Great Lakes, a strategy and implementation plan was developed to address the issue of barrel burning. This strategy was developed by the dioxins/furans Workgroup, Burn Barrel Subgroup and was finalized in February 2004. While the reduction of dioxin and furan emissions was the driving factor behind the development of this strategy, the reduction of several other toxic emissions, including chlorobenzenes, is an acknowledged benefit of its implementation. Among the goals of the strategy is the sharing of knowledge and tools with other jurisdictions outside the Great Lakes area to help address this problem nationwide.

PCB Use, Storage and Disposal
In 1980 regulations prohibiting new uses of PCB-containing dielectric fluid were introduced by Environment Canada. Revisions to existing regulations on use and storage of PCBs are currently being developed. The proposed Polychlorinated Biphenyls (PCB) Regulations will replace the Chlorobiphenyls Regulations and, while incorporating most of the original requirements, will add new provisions to end the use of PCBs and track their destruction.

The Storage of PCB Material Regulations (1992) will also be amended at the same time to set a time limit on the destruction of PCBs. Time limits on storage before destruction will also be set.

PeCB is present in small amounts in the original PCB fluids used, and in larger quantities in the Tri- and TeCB blend used to top up transformers. As these dielectric fluids are incompatible with new transformers, the gradual elimination of PCB equipment will also lead to their gradual elimination.

Wood Treatment
The substance of concern in the wood treatment industry is pentachlorophenol, which is a registered pesticide. This substance is one of the five pesticides targeted by the Wood Preservation Strategic Options Process. This process led to the development of the Recommendations for the Design and Operations of Wood Preservation Facilities (G.E Brudermann as cited in Environmental Protection Service (2005)) in 1999 and the related facility and process assessment program. One of the objectives is to reduce or eliminate the release of wood preservative chemicals to the environment. A report on the results of the assessment program (Stevens et al., 2001 cited in Environmental Protection Service (2005)) indicates an average overall conformance level of 68% (36-93% range by criteria) for pentachlorophenol facilities. This conformance level implies a reduction of total chlorobenzenes released to the environment. The Recommendations for the Design and Operations of Wood Preservation Facilities was revised and published in 2004. Final conformance assessments are scheduled to be completed by 2005.

Waste Incineration
Canada-wide Standards for the reduction of dioxins and furans emissions from this sector have been developed by the Canadian Council of Ministers of the Environment and were agreed to by the Minister of the Environment (under s. 9 of CEPA 1999) in 2001 (municipal solid waste, hazardous waste, medical waste and sewage sludge incineration) and 2004 (conical municipal waste combustion). An 86% reduction in releases from municipal solid waste, hazardous waste, medical waste and sewage sludge incineration is expected by 2006. Conical waste combustion will be phased out in Newfoundland by 2008 and new conical waste combustors are prohibited in all jurisdictions in Canada. These efforts should also reduce the amounts of PeCB generated by similar mechanisms and emitted from the same sources.

In Ontario, the Ministry of Environment amended Regulation 347 to phase out hospital waste incinerators by December 2003. Hospital wastes are now managed by sending them to a centralized waste incinerator with state-of-the-art technology or by alternative waste management methods.

Perchloroethylene Use
Regulations for the control of perchloroethylene, also deemed a toxic substance under CEPA 1999, were developed by Environment Canada and published in March 2003 for the dry cleaning sector and, in August 2003 for the solvent degreasing sector. By reducing the perchloroethylene releases from these sectors, the PeCB releases will also be reduced.

Iron and Steel Mills
The Canada-wide Standards for dioxins and furans were developed to set a goal for reduction of dioxins and furans emissions from electric arc furnaces found in steel manufacturing and from iron sintering plants. They were developed by the Canadian Council of Ministers of the Environment and were agreed to by the Minister of the Environment (under s. 9 of CEPA 1999) in 2003. Implementation of the Canada-wide Standards for dioxin and furans emissions should also likely reduce the amounts of PeCB generated by similar mechanisms and emitted from the same source.
USA

Transportation of Dangerous Goods
PeCB is classified as a hazardous material under the U.S. Hazardous Materials Transportation Act, and as such it must be properly labelled and packaged for transportation. A spill notification procedure is also included.
Source: Environmental Protection Service (2005)

6.1.2 International regulation
No new information

6.1.3 Risk management instrument/tools Canada

In the Canadian report “Pentachlorobenzene (QCB) and tetrachlorobenzenes (TeCBs) proposed risk management strategy” (2005) several risk management instrument/tools are proposed:

PeCB and products containing PeCB

Since PeCB in Canada is considered persistent, bioaccumulative and a toxic substance, a preventative approach is required to prevent its reintroduction into the Canadian market. In this case, a regulation is the only effective way to ensure this objective is met. In the proposed Regulations Amending the Prohibition of Certain Toxic Substances Regulations, 2005 it is therefore proposed that PeCB is added to the Prohibition of Certain Toxic Substances Regulations, 2005.

PeCB is found as contaminant in certain chlorinated chemicals, therefore, concentration limits should be established, taking into consideration environmental risks and economic and technology factors. Consideration will therefore be given to the development of guidelines to complement the regulations, where environmentally acceptable contamination levels of chlorobenzenes in products or mixtures can be recommended. Two regulations that came into effect in 2003 (Dry cleaning and Degreasing) will work towards reducing the use of perchloroethylene and its emission to the atmosphere. As a contaminant in solvent perchloroethylene (see also solvent use in Table 4.3), chlorobenzenes emissions will also likely be reduced. No additional action is proposed for this sector.

PeCB is not on the National Pollutant Release Inventory. However, Environment Canada is considering adding PeCB to the inventory in order to monitor progress towards the proposed objectives.

PeCB releases

Barrel Burning
Barrel burning of household waste is a complex problem as jurisdiction over this issue is mainly municipal. It has been recognized as an important source of dioxins and furans, and efforts to address the problem are being made by the provinces of British Columbia and Nova Scotia and through the Great Lakes Binational Toxics Strategy. As dioxins
and furans are a human health issue, efforts to control these emissions will likely take a high priority. Any efforts to reduce dioxin and furan emissions from this source will also reduce PeCB emissions.

Due to the various strategies in place for this sector, no additional action is recommended. It is recognized that providing residential waste management infrastructure as an alternative to open burning of garbage in rural areas remains a challenge.

Dielectric Fluids
Two existing regulations related to PCBs (Storage of PCB Material Regulations, 1992, and Chlorobiphenyls Regulations, 1991) are being revised to address the gradual elimination of PCB materials in use and in storage, and therefore the gradual elimination of other substances present as contaminants in them. No additional action is proposed for this sector.

Wood Treatment
Recommendations for the Design and Operations of Wood Preservation Facilities (Brudermann, 2004) are already in place. All but three facilities have complied with this voluntary program. A proposed pollution prevention planning Notice is currently being developed to address the three facilities that have not complied. No additional action is proposed for this sector.

Pesticides
Pesticides are regulated under the authority of the Pest Control Products Act, which is administered by the Pest Management Regulatory Agency (PMRA). The PMRA will manage PeCB contamination in pest control products according to its Regulatory Directive The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy (Dir99-03).

Under Directive 99-03, levels of micro-contaminants of concern in pest control products are reviewed to ensure that products, and the uses for which they are registered, do not pose unacceptable risks to people or the environment. The PMRA works in partnership with registrants to reduce/eliminate micro-contaminants of concern in line with the best available technology from a manufacturing perspective and encourages the development of new technology.

PeCB occurs as a micro-contaminant in certain pest control products. PMRA's strategy with respect to PeCB will likely mirror the steps followed for the risk management of hexachlorobenzene (HCB). These steps are likely to be:
- Identify all currently registered Technical Grade Active Ingredients containing PeCB and estimate releases;
- Inform all registrants of these products and request action plans for the reduction of PeCB, with the ultimate goal of virtual elimination;
- First round of requests will target the registrants of products containing 0.1 ppm or more (based on HCB strategy) of PeCB and not already handled by another initiative.
Municipal Waste Incineration
PeCB is unlikely to be found in the feed stream of municipal solid waste, and are therefore considered to be mainly products of incomplete combustion. Controlled incinerators using air pollution control systems designed to reduce mercury emissions through the use of powdered activated carbon should effectively control chlorobenzenes emissions. Uncontrolled incinerators, such as conical and pit burners, are planned to be phased out by 2008 under the Canada-wide Standards for dioxins and furans (Canadian Council of Ministers of the Environment, 2001, 2003). This strategy would eliminate this source of chlorobenzenes.

Hazardous Waste Incineration
Implementation of the Canada-wide Standards for Dioxins and Furans will be monitored by a committee of the Canadian Council of Ministers of the Environment (CCME) responsible for air management. The implementation of the Canada-wide Standards is expected to favourably impact emissions of PeCB. Since this strategy is already in place, no additional action is proposed for this sector.

Iron and Steel Plants
Canada-wide Standards for dioxins and furans (Canadian Council of Ministers of the Environment, 2003b) are already in place. No additional action is proposed for this sector.

Metals Processing
As the information for these sectors is incomplete, further investigation may be necessary before determining if action is needed in these sectors and what that action may be. As the estimated releases from this sector are relatively minor, developing an action plan for this sector is not a priority at this time.

6.2 Alternatives/substitutes
No new information

6.3 Emission control techniques
No new information

6.4 Costs and benefits of control
The information in the paragraph below is derived from the proposed “Regulations Amending the Prohibition of Certain Toxic Substances Regulations, 2005” as published in the Canada Gazette on July 9, 2005.

The purpose of adding PeCB to Schedule 1 of the Prohibition Regulations is to ensure that PeCB is not introduced into Canada. PeCB is not intentionally produced in Canada, and there is no commercial domestic demand for this substance. There are also no known natural sources of PeCB. PeCB is present in products as impurities or is unintentionally produced through for example waste incineration.
As a consequence, no significant incremental costs or benefits will accrue as a result of placing this substance on Schedule 1 of the Prohibition Regulations. The federal government may incur some minor costs to ensure that PeCBs are not reintroduced in Canada.
REFERENCES


Environmental Protection Service (Chemicals Control Branch), Pentachlorobenzene (QCB) and tetrachlorobenzenes (TeCBs), Proposed risk management strategy, Canada, January 2005


