

Webinar PCB – A Forgotten Legacy? 1 November 2016

POLYCHLORINATED BIPHENYLS (PCB) IN OPEN APPLICATIONS



Basel Convention



Rotterdam Convention



Stockholm Convention

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Outline



- Convention's provisions on PCB
- Production of PCB
- Uses of PCB
- Open applications
- PCB Elimination Network (PEN)
- Work of PEN on PCB in open applications
- Case study Switzerland

Convention's provisions on PCB

- PCB are one of the **12 initial POPs** listed in the Stockholm Convention
- **Art. 3** of the Stockholm Convention prohibits production of PCB, but PCB are still in use in many applications and stockpiled in many countries.
- According to **Annex A, Part II (f)** of the Convention

“Parties shall endeavor to identify other articles containing more than 0.005 per cent polychlorinated biphenyls (e.g. cable-sheaths, cured caulk and painted objects) and manage them in a manner protective human health and the environment (according with paragraph 1 of Article 6)”.

Effects of PCB on the environment:



Travel **long distances**



Persistent



Toxic to animals



Bio-accumulate in the food chain



Effects of PCB on human health:

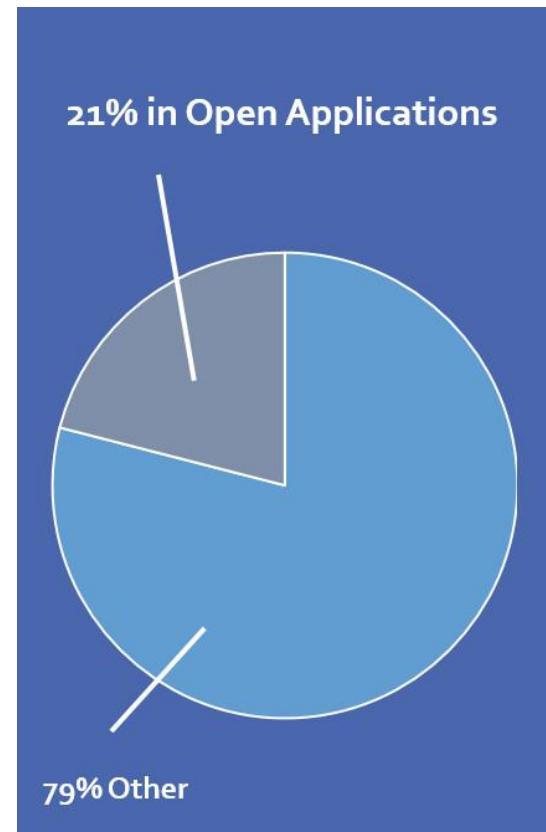
- Can increase *risk of cancer*
- Can interfere the *hormone system*
- Can lead to *failure of reproduction*
- Can suppress the *immune system*

Production of PCB

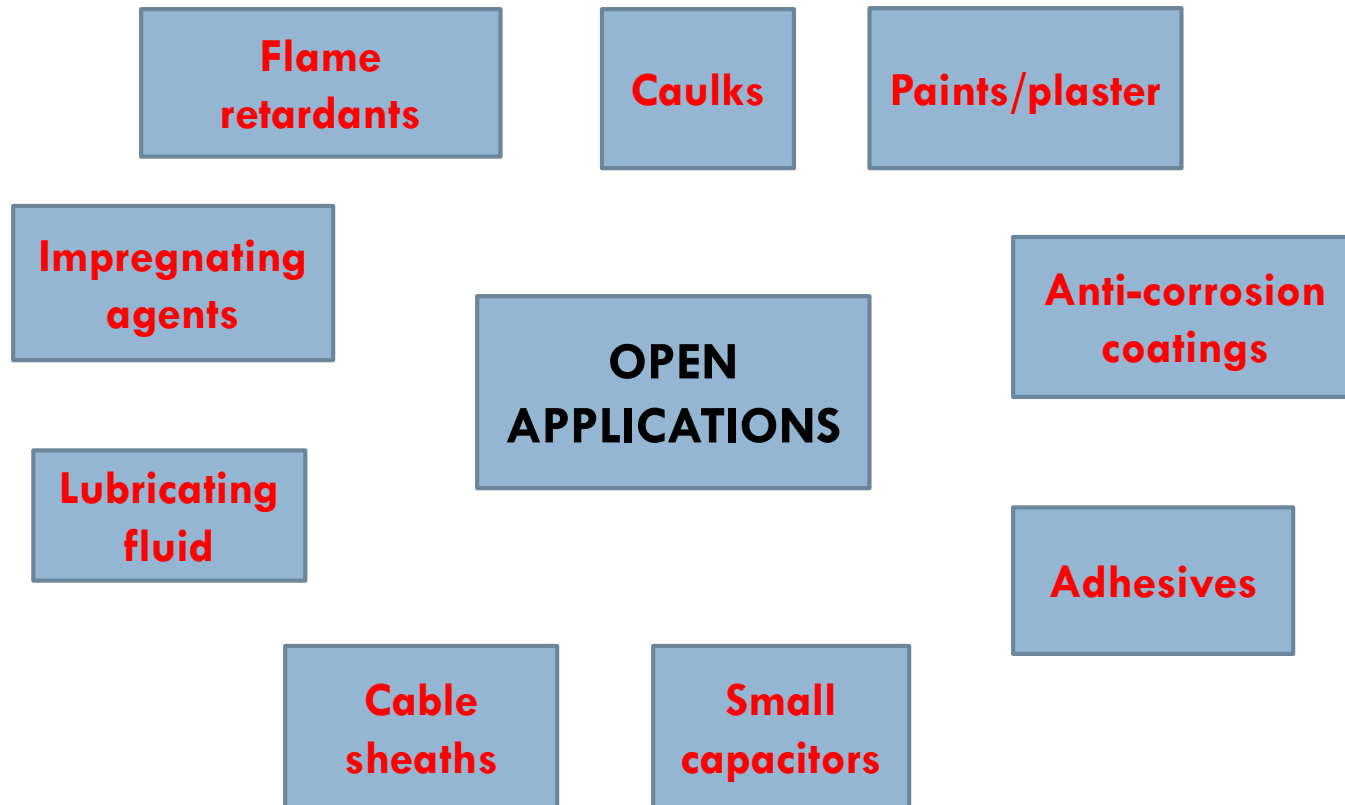
- PCB were manufactured worldwide by a small number of companies in mostly industrialized countries and were/are found in a **wide range of applications (between 1 and 1.5 million tonnes)**
- Globally, the PCB production peaked in the 1960s and 1970s. Between 1983 and 1993, the production of PCB was stopped in many countries
- In some countries it had already been regulated since the early 1970s

Uses of PCB

- **Closed applications:** mainly transformers and capacitors
- **Open and partially open applications**
- It is estimated that approximately **21% of produced PCB** were used in open applications (Breivik, K., et al., 2007).



Open applications



Characteristics and risks

PCB were widely used to act as:

- Flame retardants, plasticisers, coolants and lubricants, impregnating agents and coats

High risk:

- In fire: formation of dibenzo-p-dioxins and dibenzofurans
- Leaking, flaking, deterioration
- Inexpert removal and inappropriate disposal

→ **Direct exposure to humans**



PCB in caulks (sealants)

Examples of use:

- **Objects:** Houses, residential and public buildings, industries, power plants, water reservoirs, military bases etc.
- **Applications:** Joints in buildings and other structures, caulks between prefabricated concrete panels, sealants around windows, door frames and vents, etc.



PCB as lubricating fluid in oils and grease

Examples of use:

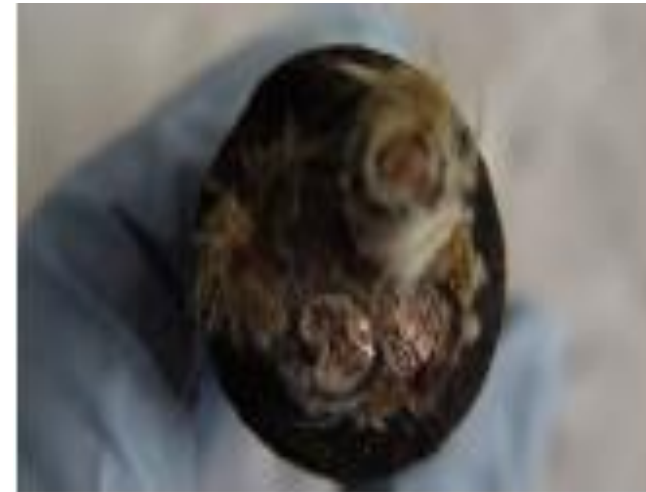
- **Materials:** Electrical equipment, air/gas compressors, heat transfer, hydraulic systems, vacuum pumps, oil-impregnated gaskets/filters, brake linings, oils, etc.
- **Objects:** Industries, plants, mines, private and public buildings, natural gas pipelines, etc.



PCB in cables and cable sheaths

Examples of use:

- **Materials:** Electrical cables, both PVC and lead jacket, any kind of cable sheaths, etc.
- **Objects:** Harbours, airports, military bases, auto salvage yards, auto crushing, recycling sites (shredders), landfills, industrial sites, etc.



PCB in paints and plaster



Examples of use (indoor and outdoor):

- **Applications:** Paint and plaster, emulsion priming and top coats for use on concrete or plasterwork
- **Objects:** Houses, residential and public buildings, (dams, industries, power plants, military bases etc.

PCBs in adhesives

Examples of use:

- **Applications:** Floor adhesives, adhesive in exposed concrete, etc.
- **Objects:** Houses, residential and public buildings, industries, power plants, military bases, etc.



PCBs in anti-corrosion coatings and ASR — other industries

Examples of use:

- **Applications:** Vessels, submarines, airplanes, cars, grain silos, window frames, valves, flanges etc.
- **Objects:** Harbours, airports, military bases, auto salvage yards, auto crushing, recycling sites (shredders), scrap dealers, landfills, industrial sites etc.



PCBs in surface coatings - Floors

Examples of use:

- **Applications:** Concrete paints and coatings, emulsion priming and top coats for use on concrete or plasterwork, resistant industrial floors, highway marking paints, etc.
- **Objects:** Houses, residential and public buildings, industrial plants, power plants, military bases, motorways, etc.



PCBs in anti-corrosion coatings - indoor and outdoor

Examples of use:

- **Applications:** Steel supports, steel structures, radiators, pipes, oil fuel tanks, machines, devices, etc.
- **Objects:** Houses, residential and public buildings, industries, power plants, military bases, etc.
- Power plants and pipelines



PCBs and Asbestos

- PCB applications were often installed together with Asbestos materials. Typical examples are fluorescent lights (PCB ballast), with an Asbestos cardboard used as flame-retardant.



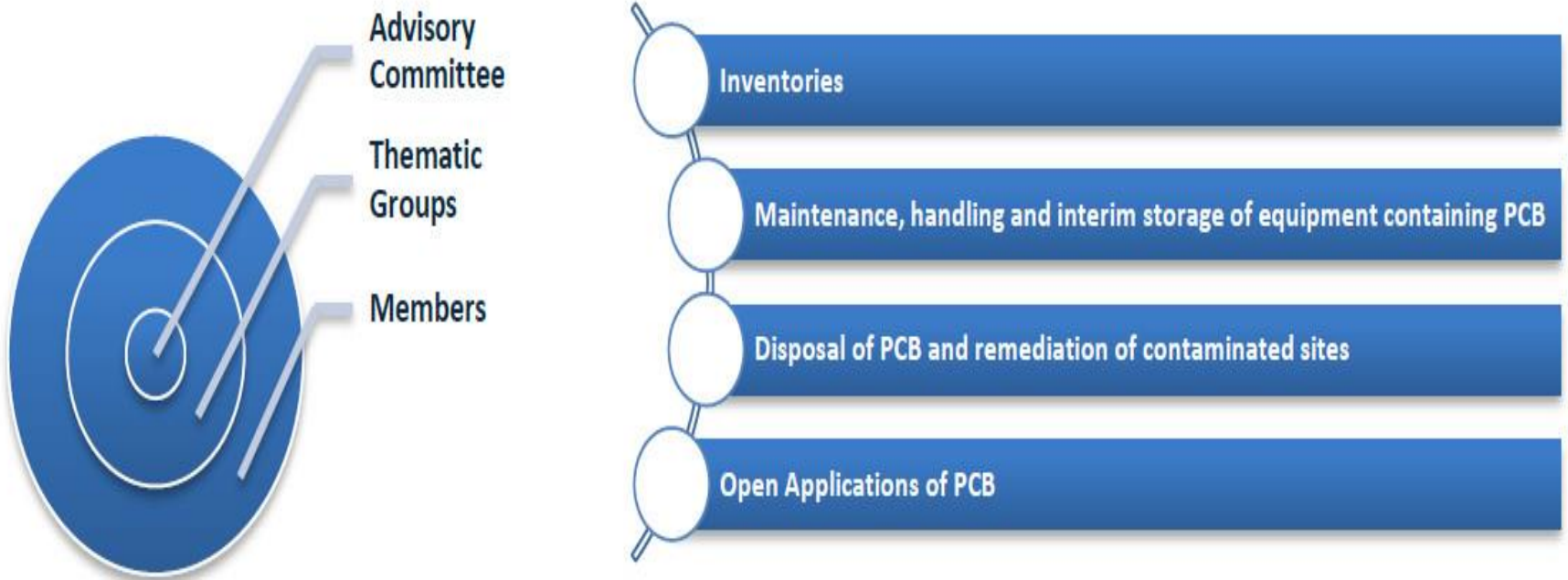
Examples of use:

- **Materials:** Fluorescent light ballasts, plaster on walls and façades, floor adhesives etc.
- **Objects:** Houses, residential and public buildings, industries, power plants, military bases, etc.

PCB and Asbestos 'Galbestos' in roofing and siding materials

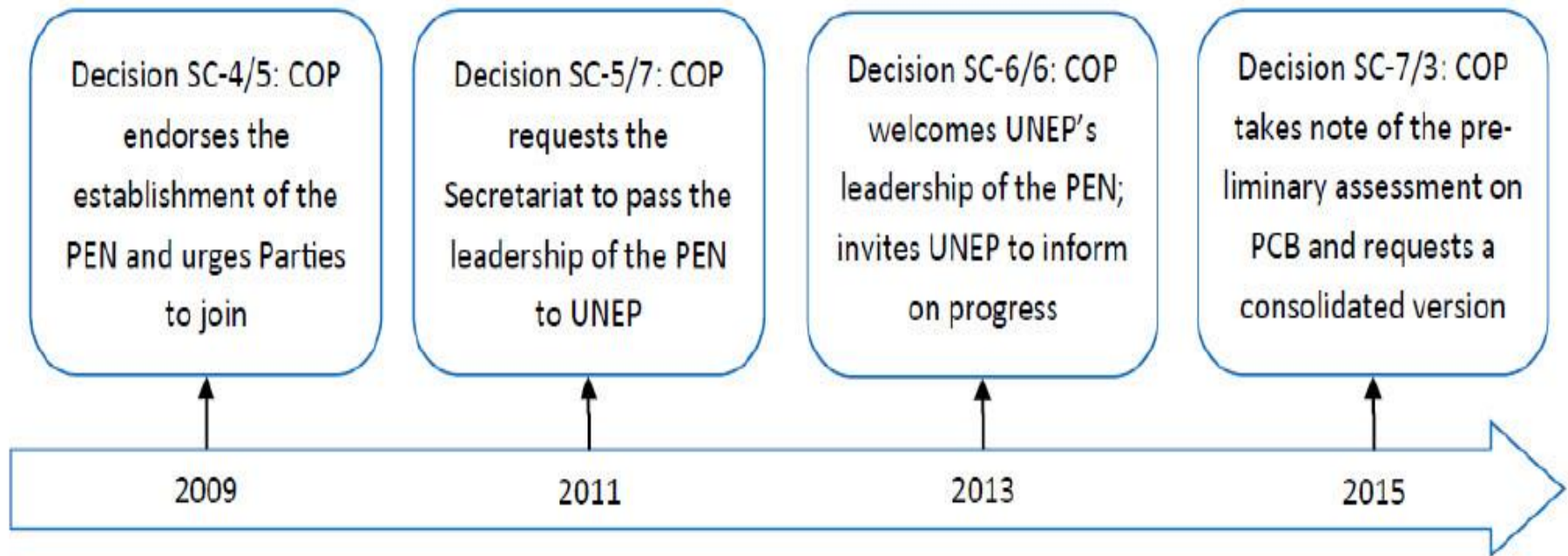
PCB Elimination Network (PEN)

- The PCB Elimination Network (PEN) is a multi-stakeholder mechanism that promotes and encourages the environmentally sound management (ESM) of PCB



PCB Elimination Network (PEN)

- The PEN was transferred from the Secretariat of the Stockholm Convention to UNEP' Chemicals and Waste Branch in 2011 (COP-5)



Become a member of the PEN

Membership of the PEN is open to:

- Governments
- Intergovernmental organizations
- Donors
- PCB holders
- Non-governmental organizations
- Industry, experts/academia
- Business sectors relevant to PCB

To apply: please send an e-mail to the **Secretariat of the PEN** (UNEP's Chemicals and Waste Branch): science.chemicals@unep.org

Work on Open Applications

- The PEN works by producing guidance material and factsheets to countries phasing out and disposing of PCB

<http://chm.pops.int/Implementation/PCBs/Guidance/tabid/665/Default.aspx>

PCB—Open Applications

Identification and
Environmentally Sound Management

Contact: Secretariat of the PEN

Chemicals Branch
Division of Technology, Industry and Economics
United Nations Environment Programme
11-13 Chemin des Anémones
CH-1219 Châtelaine (GE), Switzerland

Email: pen@pops.int
Web: www.pops.int/pen

**PCB IN OPEN APPLICATIONS:
MACHINERY AND INSTALLATIONS**

What are PCB?
PCB (polychlorinated biphenyls) are a serious threat to human health and the environment. Among others, they are considered to be carcinogenic, immunotoxic and affect reproduction and are therefore among the chemicals listed in the group of POPs (persistent organic pollutants) regulated under the Stockholm Convention. While the Stockholm Convention prohibits production, PCB are still in use in many applications and stockpiled in many countries. Once released into the environment, PCB remobilise and enter the ecological food chain, eventually contributing to human exposure via food intake. Apart from the well-known applications of PCB in closed systems like transformers and capacitors, PCB were also widely used in open and partially open applications to enhance physical and chemical resistance, to act as plasticizers, flame retardants, impregnating agents, coolants, and lubricants. It is estimated that approximately 21% of PCB were used in open applications*. Many of these open applications are still in use today, and they are usually not defined as hazardous waste at the time of disposal. PCB in open applications often find their way into the environment. The first step to reduce human exposure is to know where to find PCB open applications.

Why are PCB used in open applications?
Many buildings worldwide, especially those constructed or renovated between the 1950s and the early 1980s, contain PCB in a wide variety of applications which emit PCB into the environment. In buildings, PCB can contribute directly to human exposure via indoor air evaporation and dust. PCB were used in open applications in many industrial, public and private buildings as well as in hydro power, nuclear power and water treatment plants, military installations, the car and shipbuilding as well as the mining industry.

Which buildings are the priority?
Many buildings worldwide, especially those constructed or renovated between the 1950s and the early 1980s, contain PCB in a wide variety of applications which emit PCB into the environment. In buildings, PCB can contribute directly to human exposure via indoor air evaporation and dust. PCB were used in open applications in many industrial, public and private buildings as well as in hydro power, nuclear power and water treatment plants, military installations, the car and shipbuilding as well as the mining industry.

DOs

- DO avoid skin contact with PCB suspect materials
- DO verify PCB suspect materials and have representative samples analysed
- DO enable access to accredited laboratories qualified to analyse PCB
- DO test for indoor air contamination in case of high PCB content in the materials
- DO integrate open system applications in national PCB inventories
- DO contact the regional environmental authority prior to any repairs or removal of suspect material

DON'Ts

- DON'T remove PCB suspect materials yourself
- DON'T reuse, recycle or sandblast PCB suspect materials
- DON'T abandon or dump PCB suspect materials
- DON'T use test kits to determine PCB content, since they are likely to provide false results
- DON'T burn PCB suspect materials (formation of dibenzo-p-dioxins and dibenzofurans)

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*Birkvik, E., et al., Towards a global historical emission inventory for selected POPs components – A mass balance approach.3 An update Science of the Total Environment, 2007, 317(2-3), p. 296-307.

Case study Switzerland

<http://www.global-chemicals-waste-platform.net/chemicals-in-products/persistent-organic-pollutants-pop/polychlorinated-biphenyls-pcb.html>

① www.global-chemicals-waste-platform.net/chemicals-in-products/persistent-organic-pollutants-pop/polychlorinated-biphenyls-pcb.html



PCBs – Case Study Switzerland

07 | 2014

Management of PCBs from Open and Closed Applications – Case Study Switzerland

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1 Background and Objectives

Polychlorinated Biphenyls (PCBs) are one of the most common and widely dispersed persistent organic pollutants (POPs). PCBs can have serious health and environmental effects, which can include carcinogenicity, reproductive impairment, immune system disruption and, by effects on wildlife, a loss of biological diversity [1, 2, 3, 4]. Most PCBs were manufactured by several companies in various industrialised countries mainly in the Northern Hemisphere. It is estimated that the total production was approximately 1.3 million tonnes of which 48% of PCBs were used for transformer oil; ca. 21% for small capacitors; 10% for other 'nominally closed' systems such as heat transfer systems and hydraulic systems, particularly in mining equipment; and approximately 21% for open uses [5]. Open and partially open applications included e.g. caulks/sealants (Figure 1), paints (Figure 2), plasticisers, anti-corrosion coatings, copy paper and flame retardants (Table 1). The large share was used in buildings and other constructions.

According to Annex A part (i) of the Stockholm Convention, Parties to the Convention are obliged to eliminate electrical equipment and oils containing PCBs from use by 2025 and to manage them using environmentally sound waste management by 2029. Therefore PCB inventories prepared for the Stockholm Convention focus mainly on the closed applications such as PCB-containing transformers and capacitors (see paragraph 4 below) (Stockholm Convention PCB). However, Annex A, Part (i) of the Stockholm Convention requires that efforts should be made to identify other articles containing more than 0.005% PCBs including uses in open applications and to manage them in an environmentally sound manner in accordance with paragraph 1 of Article 6. Apart from this requirement of

the Stockholm Convention, the handling, remediation, removal and disposal of PCB uses in open applications of PCBs are not yet regulated by any international guidelines despite their high relevance for human and environmental exposure. Due to the lack of regulations and awareness obsolete turbines, generators, power aggregates etc. painted with PCB (Figure 2) are often labelled as being re-usable and are therefore outside the scope of the Basel Convention, Article 6(1)(d)(ii) of the Stockholm Convention which requires that upon becoming wastes articles are not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants needs to be applied more stringently. This fact sheet therefore focuses on PCBs in open applications as these uses have been given relatively little attention by most countries.

Since current PCB inventory activities under the Stockholm Convention focus mainly on the closed applications the situation on PCB inventory and management of closed systems is described briefly in chapter 4 and links to related guidance papers and technical reports in chapter 5.

The remediation and management of PCBs in open applications is important because of the relatively high levels of human exposure and environmental releases compared to closed systems and their associated health effects. Although open uses accounted for only approx 21% of the total production it is estimated that approximately 50% of the total PCB emissions have come from these 'open system' uses [5]. Long-term exposure to even small concentrations can have adverse effects on human health, especially on the unborn child [6, 7].

| | |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Caulks/Sealants (buildings, bridges); rubber seals; gasket sealers | Lubricating fluid in oils and greases; cutting oils |
| Paints and plaster (buildings, construction, swimming pools, marinas) | PCBs as flame retardant and impregnating agent (e.g. interior wood sealing for panels and floor finishes [1]) |
| Anti-corrosion coatings (indoor and outdoor) | Adhesives |
| Sealed double glazing windows (e.g. in houses) | Carbonless copy paper |
| Surface coatings (for example floors) | Pesticide containers |
| Cables and cable sheaths | Inks |

Table 1: Some open applications of PCBs

1

Global Chemicals and Waste Information Platform



Chemicals in Products | Persistent Organic Pollutants (POP) | Polychlorinated Biphenyls (PCB)

Polychlorinated Biphenyls (PCB)

Polychlorinated Biphenyls (PCBs) are a class of industrial organic chemicals listed in the Stockholm Convention as persistent organic pollutants (POPs). PCBs are one of the most common and widely dispersed POPs. They can cause serious health problems (e.g. carcinogenicity, reproductive impairment and immune system disruption) as well as environmental effects (e.g. soil and water contamination, bioaccumulation throughout food webs, and loss of biological diversity [1], [2], [3]).

PCBs have a low electrical conductivity, a high resistance to thermal breakdown, and a high resistance to oxidants and other chemicals. Consequently, since 1930, PCBs were used in a variety of closed industrial applications; mainly as dielectric fluids in capacitors and transformers and in open applications such as paints, sealants, cutting oils, paper, and textiles. It is estimated that the total PCB production was approximately 1.3 million tonnes, of which 48% were used for transformer oil; about 21% for capacitors; 10% for other 'nominally closed' systems such as heat transfer systems, hydraulic systems, and particularly in mining equipment; and approximately 21% for open uses [4]. PCBs were produced for more than fifty years until the 1980's and have been exported as chemicals and in products to virtually any country in the world.

The Stockholm Convention has set ambitious goals for phasing out the use of any

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Guidance

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Management of PCBs from Open and Closed Applications - Case Study Switzerland

Initiatives | Projects



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Stockholm Convention

Thank You!!

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