2024

PCB Webinar Series

Webinar #1

PCB Elimination Experiences

Webinar Report

28 August 2024

unitar
United Nations
Institute for Training and Research

Introduction

Polychlorinated Biphenyls (PCB) are a class of synthetic chlorinated organic chemicals that represent a risk as they are toxic to wildlife and humans, persistent, and can bioaccumulate and travel long distances in the environment. Furthermore, they are classified as carcinogens, and they can suppress the immune system, which can increase the risk of developing a wide variety of diseases. There is scientific evidence that humans are exposed to PCB through ingestion of animal fats, inhalation, and absorption through the skin. Workers in the electrical sector can be particularly exposed to PCB as these chemicals may be present in older electrical equipment such as transformers, capacitors and fluorescent lighting ballasts.

The PCB have been listed under the **Stockholm Convention** as Persistent Organic Pollutants (POPs). Parties that ratified the Stockholm Convention aim to eliminate the use of PCB by 2025 and to provide their environmentally sound waste management by 2028.

Noting that the environmentally sound management of PCB requires enormous efforts and specific technical knowledge from different stakeholders -from national governments, companies, and international and civil society organisations, among other sectors-UNITAR developed the **2024-2025 PCB Webinar Series** to raise awareness and enhance global and national capacities.

This Webinar #1, "**PCB Elimination Experiences**," aimed to introduce key ongoing projects and activities, challenges and opportunities related to the Elimination stage and other relevant stages of the management of PCB, such as Sampling, Screening, and Analysis.

This event also served to collect views and questions from participants to advance in the definition of topics for the following webinars of the series.

Agenda

3:00 - 3:15 PM	Our Work and Experiences on PCB Projects	Sofia Schlezak, UNITAR PCB Projects Coordinator
3:15 - 3:30 PM	Technical Challenges and Opportunities in PCB Projects	Mario Mendoza, UNITAR Sr Expert
3:30 - 3:50 PM	First-hand Experience from Ethiopia	Mehari Wondigmagen, PCB Project Coordinator, Ethiopian EPA
3:50 - 4:05 PM	Practical Information on PCB	Agustin Harte, Programme Management Officer, PCB Focal Point, BRS Secretariat
4:05 - 4:30 PM	Ask the Expert Session	Urs Wagner, PCB Sr Expert Mario Mendoza, UNITAR Sr Expert

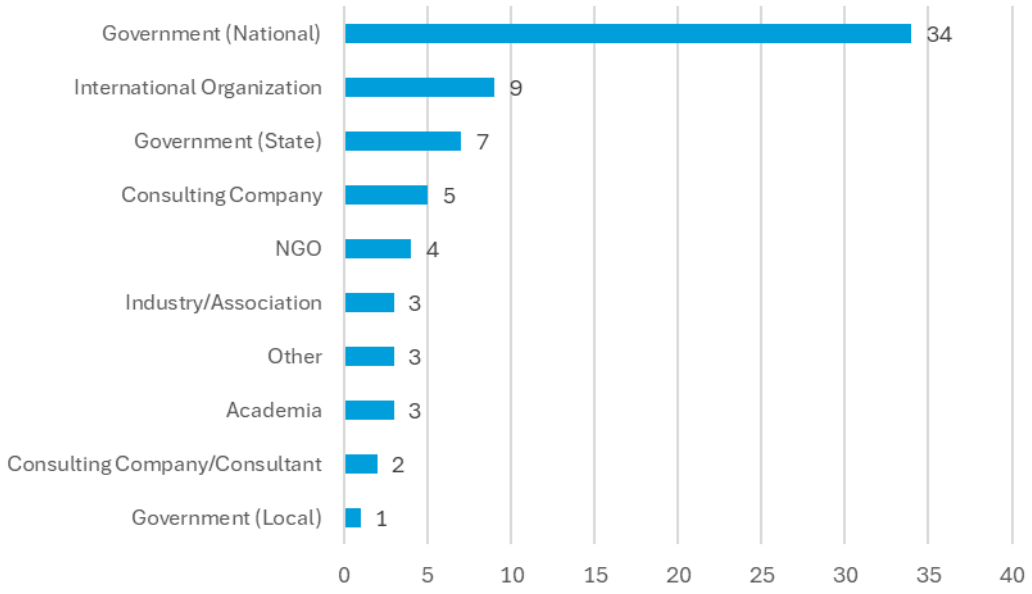
Resources

The resources for this webinar (flyer, presentations, satisfaction Survey, recording) are available in the Share Folder https://unitaremail.sharepoint.com/:f:/g/cwm/EkIqhjpF5UtBr-u0VHob-8ABYmo9BjlgjN8GFjbt9uO72w?e=ZfNpgz and will be uploaded in the PCB e-Learning Platform by September 16 https://pcb.unitar.org

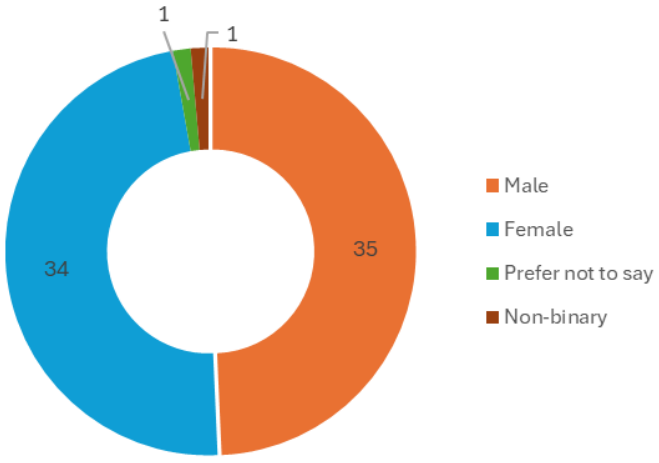
Attendance breakdown and representation

Total attendance: 71 participants

SECTORS



GENDER DISTRIBUTION



COUNTRIES REPRESENTATION

Country	#	Country	#
Peru	5	Germany	1
Honduras	4	Brazil	1
Canada	4	Italy	1
Switzerland	4	Botswana	1
Argentina	4	Indonesia	1
Senegal	3	Kenya	1
Chile	3	Nigeria	1
Colombia	3	Ethiopia	1
Panama	3	Myanmar	1
Ghana	2	Congo, Democratic Republic of the	1
Sweden	2	Spain	1
Moldova, Republic of	2	Jordan	1
Russia	2	Trinidad and Tobago	1
Iraq	2	Venezuela	1
Burundi	2	Poland	1
Côte d'Ivoire	2	Romania	1
Netherlands	1	Costa Rica	1
Algeria	1	Togo	1
Philippines	1	United States	1
Maldives	1	Nicaragua	1

Questions received and answered

DISCLAIMER: PCB experts suggest the following answers based on their academic training and professional experiences. Please refer to official materials for legal provisions related to the Stockholm and Basel conventions.

Q: Where can the participants find more information? A: Existing technical material available online:

- Material in the SC website: https://chm.pops.int/Implementation/IndustrialPOPs/PCB/Guidance/tabid/665/Default.aspx
- New documents developed by the PCB Small Intersessional Working Group under the Stockholm Convention (PCB SWIG): https://chm.pops.int/Implementation/IndustrialPOPs/PCB/SIWGonPCB/Overview/tabid/9725/Default.aspx
- BC Training Manuals: https://www.basel.int/Portals/4/Basel%20Convention/docs/meetings/sbc/workdoc/TM-A.pdf/ and https://www.basel.int/Portals/4/Basel%20Convention/docs/meetings/sbc/workdoc/TM-B.pdf/
- UNITAR PCB learning platform: https://pcb.unitar.org/

Q: How do you dispose of Pure PCB oils? A: Based on experience, the BAT option remains incineration, given its efficiency and usually the cost factor. The cost of dechlorination is directly related to the PCB concentration (when the concentration increases, the cost increases). Therefore, with concentrations above 5000 ppm, as with pure PCB, the more economically reasonable option is incineration. There are exceptions, but it is essential to analyse and evaluate them case by case.

Countries should also remember Ethiopia's lessons about the many hurdles overcome by transboundary movement (including transportation routes or notification processes).

Q: Is there a quick way/mechanism that has been developed to conduct a visual inspection to identify equipment containing PCB that officers in the field may use and instantly obtain the results of? Some experiences mention that the year of manufacture of the transformer is key to deciding whether or not it contains concentrations of PCB of interest. Normally, the year 1986 is used as the limit. What experience have you had with this? A: Although the topic of this webinar was elimination, the first and most important step to achieve elimination is the inventory of PCB, and a visual inspection is the first step towards doing a preliminary inventory. The revised draft, "Guidance for development of PCB inventories and analysis of PCB," developed by the PCB Small Intersessional Working Group under the Stockholm Convention (PCB SWIG), includes a section on this topic. The current revision (August 2024) reads: *"The preliminary inventory is used for scoping, and orientation and has to be completed by a quantification step, which at least would consist of visual inspection but preferentially by more elaborated steps."*

The experts responded that PCB contamination in electrical equipment (transformers) cannot be visually examined for confirmation purposes. The nameplate may provide basic information, but as a transformer is not hermetically sealed, cross-contamination by oil topping, maintenance, etc., can usually not be excluded. Experts emphasised that countries should remember that, in general, companies do not have a detailed maintenance history report, so there are transformers that, according to the technical data, are free of PCB but might have cross-contamination because the maintenance service was not reported. Therefore, experts suggested countries conduct further steps like screening, sampling, and laboratory analyses.

Countries should note that there are no limitations to the method with capacitors. If the nameplate is original, the information is often sufficient to classify without further verification (by analysis, into our assessment or inventory), as later contamination after production is not possible.

Q: Temperatures for destruction incineration? A: Ideally, more than 1000 C (between 1100°C[1] - 1300°C) with a residence time of 1,5 – 3 sec to avoid the generation of other very hazardous molecules, such as dioxins and furans. Some factors may affect the efficiency of PCB incineration, such as the waste mix and the type of chamber. PCB incineration above 1300 °C and less than 3 seconds of residence may lead to more than 99.999% efficiency. For further information, please refer to the technical guidelines on D10 and R1 operations under the Basel Convention.

Q: How effective are the analyses carried out by the L2000 analyser compared to those carried out by the gas chromatography method, especially at low levels of around 50 ppm in PCB? A: The Clor-N-Oil test kits and the L2000 analyser were developed by the US EPRI Institute and DEXSIL in the late 70s to determine quick and reliable potential PCB in cooling fluids by detection of the total chlorine concentration but not the PCB concentration in particular[2]. Therefore, these methods were never intended to "replace" laboratory GC Analysis. They are helpful and reliable tools in PCB Assessments by approved and well-established systematic proceedings step by step from preliminary site visits to sampling, screening, analysis and documentation.

By this SCREENING method, the total number of oil samples that need lab analysis can be relevantly reduced (as was illustrated by Ethiopia, going from a total of 6,011 samples to 2,236 samples for lab analysis) and the active participation of electricians and technical staff from utilities and other stakeholders is possible in such PCB assessment projects.

Important to note: 1) It is emphasized that sampling and screening equipment should only be purchased when the inventory teams are ready to go. The expiry of Clor-N-Oil test kits is 12 month and for L2000 DXT oil reagents it is 24 months. 2) Cost-benefit analysis is needed. In some rare cases, countries can reach to similar costs for the L2000 equipment, or Clor-N-Oil kits in comparison to paying for semi-quantitative chromatography analysis. However, in a cost-benefit analysis, the risk and costs of transporting a large number of potentially PCB containing samples must also be considered 4) Time and resources to train the electrical engineers and technicians in sampling, handling of PCB-containing equipment and working with screening tools during general operation and maintenance activities should be considered as an excellent opportunity to build sustainable local capacities. 5) Finally, the training of inventory teams (including local electrical engineers) as well as the training of the trainers MUST be done by hands on activities. Such substantial practical related training cannot be replaced by any screen workshops.

Other questions

Q: Is the number of samples collected a result of a statistical analysis? What was the case in Ethiopia? A: In practice, there are several ways of calculating the number of samples to be collected. It should be noted that having a statistical analysis might help size the problem and set the right priorities for inspection, sampling, screening and analysis, but countries will still need, at the long term, to sample and analyse ALL equipment to ensure they are PCB free (unless other

[1] Technical guidelines on the environmentally sound incineration of hazardous wastes and other wastes as covered by disposal operations D10 and R1

[2] ETI YouTube Video CNO English: https://www.youtube.com/watch?v=pt4JsqvF2y4

methods are used). This analysis may vary from country to country and also within utilities or industries. In the case of Ethiopia, the selected samples collected were the result of an evaluation of the probability of finding PCB contamination, meaning equipment manufactured before 1992, equipment without manufacturer nameplates, etc. The approach was also based on the possibilities and limitations of the specific GEF project conducted in the country.

Q: Cost of elimination per ton? Best available technologies for elimination and cost? A: BAT/BEP decisions for costs should/must be based on specific requirements according to reliable inventories. Countries should note that each case must be individually, as the costs have to do with many factors. For example, the concentration of the waste, the location of the waste, the point of treatment or disposal, and the route it will follow, among others. In general terms and according to the experts' knowledge on previous experiences in Latin America before the pandemic, prices ranged from 5 to 7 USD/kg for both declaration and incineration or export of products. These costs have been rising during the pandemic due to restrictions due to transportation problems, and perhaps in 2022 or 2023, some peaks reached 9 USD/kg.

Q: Retrofilling efficiency? In which cases retrofilling is recommended and in which cases is not feasible? A: When applied under 500 ppm (with new oil), the retrofilling reduces the PCB concentration to 10% of the original concentration. Retrofilling remains an option for certain transformers, either newer ones or specifically constructed ones. However, the decisive factor is the contamination level. Usually, 3000 ppm is the utmost to remain economical. An additional vital point to be considered is that retroflling always multiplies waste to be eliminated and there will be a need for an additional process to eliminate the PCB from the extracted oil. It is also worth mentioning that the oil for retrofilling has to be dechlorinated first, and may need several rounds before achieving a concentration lower than 50ppm.

Q: Is there a list of recognised PCB eliminators worldwide? Currently, there is not an updated list. An old list is available here:
https://chm.pops.int/Implementation/IndustrialPOPs/PCB/Guidance/tabid/665/Default.aspx

Q: What is the most effective approach to address PCB in open systems? Experts recommend starting with a survey/research, if and what potential open application products might have been used in the country between the 60ties and early 80ties, and to consider a joint proceeding including asbestos and chlorinated paraffins (SCCP and MCCP). A possible approach would be to include construction and demolition waste (CDW) as it is a worldwide a leading waste stream where such applications may end. Often, developing and countries in transition received in the 60ties and 70ties complete installations like e.g. hydro power plants and pipelines unintentionally containing PCB and Asbestos, as it was state of technology. About 25% of PCB production has been used in open applications like corrosive protection paints, floor coatings, sealants and many other products.

As the name indicates, OPEN applications may directly impact health and the environment. Open applications are more complex than closed systems like cooling fluids in electrical equipment. Please refer to the information materials on the SC website. This might also be a relevant topic for future webinars.

Q: What can be in situ techniques for the treatment of PCB? A: There are exceptions, and each case must be analysed and explicitly evaluated. In general, for the countries that do not have national capacities to eliminate PCB domestically, the strategy most convenient is: 1) Under 500ppm: retro-filling plus dechlorination; 2) 500ppm - 5000ppm: dechlorination; 3) Over 5000ppm: incineration

(and autoclaving). It is worth mentioning that there are other complementary operations to apply, such as the decontamination of metallic parts and solvent recovery. Incineration or stabilization and landfilling of porous parts, etc.

Q: Discussions on PCB inventories forms update & strategy to achieve the PCB global targets 2025 2028? Is there any available funding? More clarification about the phase-out plan of PCB? A: Please refer to Agustin Harte's presentation and the SC website.

Q: What are the model regulatory experiences for implementing these obligations under the Stockholm Convention? A: This question will be addressed in future sessions, but we suggest accessing online materials.

Q: How do we remediate PCB-contaminated sites? A: Please refer to the SC website. The BRS Secretariat is leading the update of the guidelines (for POPs in general, not PCB-specific).

Q: How to encourage the provision by holders of transformers with PCB in service, especially in terms of compensation for replacement? A: A document that addressed the topic was published for the last COP. Please refer to the SC website.

Q: Which are the alternative/substitute oils besides mineral oil? A: As PCB were banned, many alternatives have been tested like, silicon oil, dry type of transformers, SFX gas, natural and synthetic esters (new vegetable oils like FR3®), among others. Briefly, the mineral oil-type cooling fluid remained the best option.

Next steps

We are developing our next webinar scheduled for **late October - early November 2024**. Please complete the survey and let us know your preferred topic for our next encounter!

Comments? Questions?

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