सत्यमेव जयते

POLYCHLORINATED BIPHENYLS (PCBs) IN POWER AND OTHER SECTORS

AN AWARENESS RAISING INITIATIVE AND ENVIRONMENTALLY SOUND MANAGEMENT MEASURES IN INDIA

Management service for the treatment of transformer mineral oil containing PCBs using the Mobile PCB De-chlorination System in India

PROJECT SPONSORED BY:

GLOBAL ENVIRONMENT FACILITY

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (MoEFCC)

Background

Polychlorinated Biphenyls (PCBs) are synthetic chemicals which are no longer produced in the world. However, they are still found worldwide. PCBs can build up in the environment and can cause harmful health effects over the period of time. Manufactured prior to the eighties, PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they do not burn easily and are good insulators.

A "PCB transformer" is a transformer that is known to contain PCBs at concentrations >500 parts per million (ppm) as an insulating fluid / oil.

PCBs were imported by many countries including India during pre and post-independence industrial development efforts. Many such transformers have unfortunately been scrapped in an unsafe manner. While in others, the oil has been replaced with other suitable mineral oils and the transformers still continue to be in service with PCB contaminated insulations and other components. There are instances where some of the transformers leak pure PCB or PCB-contaminated oil and the oil seeps into the soil and water to be ingested by plants and mammals.

Prior to knowing some of the unintended consequences due to their widespread use, PCBs were also sprayed on dirt roads to keep the dust down. Wastes from the manufacturing process that contained PCBs were often placed in dump sites or landfills. Occasionally, accidental spills and leaks from these facilities or transformer fires resulted in PCBs entering the environment.

In the 1960s, when initial research results were released, traces of PCBs were detected in people and animals around the world – not just in heavily populated cities but also in remote areas as far as the Arctic regions. The migration of PCBs occurred due to Transboundary movement.

Transboundary Movement includes:

- Chemicals that are transported through erosion, flood plains, water, biota etc.
- Chemicals that are semi-volatile
- Chemicals that evaporate over warmer regions and condense in colder atmospheres including regions
- where their use is non-existent

What are Polychlorinated Biphenyls (PCBs)?

PCBs belong to a family of man-made organic chemicals such as chlorinated hydrocarbons that were widely used in the past since 1920's, mainly in electrical equipment. PCBs production was banned worldwide at the end of the 1970s.

PCB structure

- Two benzene rings with 1 to 3 chlorine atoms.
- 209 possible congeners or forms of PCBs.
- Produced by the reaction of Biphenyl with Cl2 using a catalyst

If potential toxicity, environmental prevalence, and relative abundance in animal tissues are considered as criteria, the number of environmentally threatening PCB congeners reduces to around thirty-six.

Why were PCBs banned?

PCBs have been demonstrated to cause cancer, as well as a variety of other adverse health effects on the immune system, reproductive system, nervous system, and endocrine system.

Health & Ecological effects of PCBs

- Suppresses the immune system, making the animal more likely to fall ill and die when exposed to infections
- Disturbs the behavior & reproduction in birds, fish & Mammals
- Contributes to population decline and health problems in fish eating mammals in PCB-polluted areas
- Acts as a cancer promoter and can cause birth defects, damage to the nervous system, immune system and liver in humans

Therefore, if proper care isn't taken in the collection and safe disposal of these materials, the cost incurred to correct the consequences will be very high. There are no remedial medical solutions available to combat the harm caused by these pollutants.

The objective here is to create awareness about PCBs that still exist in our power generating stations and other industries. Further, the plans made by the Government of India and United Nations Industrial Development Organization (UNIDO) to support the stakeholders (having such equipment/oil contaminations) in disposing them in a safe and cost effective manner are included so that the environment is free from the hazardous contamination caused by PCBs. It is helpful to note that a PCB filled transformer, even though is in service, does not pose a threat to the environment if it is well sealed & leak proof.

Regulations governing PCBS and PCB equipment

Awareness about the pollution and toxicity of PCBs contributed to its ban in 1979 and has resulted in an International Environmental Treaty, the 'Stockholm Convention on Persistent Organic Pollutants (POPs)'. POPs are substances which

- Persist in the environment
- Bio-accumulate and are toxic in nature
- Have Long-Range Transport Potential and can result in adverse environmental and human health effects at locations
- even far from their sources

The convention promotes environmental sound management and disposal of PCBs. Under this convention, more than 160 countries have resolved to eliminate such polluting materials from their countries. The Republic of India signed the Stockholm Convention (SC) on POPs on 14 May, 2002 and ratified it on 13 January, 2006.

The Ministry of Environment, Forest and Climate Change (MoEFCC) was appointed as the National Focal Point for the SC. Being a signatory to this convention, our country is obligated to eliminate these types of materials by 2025. Under the guidelines of MoEFCC and UNIDO, the project "Management service for the treatment of transformer mineral oil containing PCBs using the Mobile PCB De-chlorination System in India" has been taken up.

If PCBs is hazardous, why were PCBs used at all?
Due to their non-flammability, chemical stability, high boiling point, and good electrical insulating properties, PCBs were used in various industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper. Consequences of its harmful properties were not known for a long time till the late 70's.

Where are PCBs found currently?
Equipment such as transformers, capacitor banks, & voltage regulators etc. or products such as plasticizers used in plants & cements, cable insulations, adhesives & tapes, oil based paints: only those made before 80s.

What are the physical properties of PCBs?
Yellow or brownish oily liquids that don't easily burn, with no smell: may sometimes smell like motor oil
Are you aware that life on the planet is threatened?
Yes! Global warming, hazardous and toxic chemicals are really threatening sustained life on the planet. Large quantities of carbon dioxide and number of hazardous and toxic chemicals are creating a shift in the environment causing irreversible damage to the environment. A Hazardous and Persistent chemical such as Polychlorinated Biphenyls is one among them.

What happened to those old PCBs?
Mostly thrown away. People did not know that PCB was hazardous, and so when the equipment became old or failed, the oils were either burnt off in boilers, stored in drums, thrown into the ground/water or reused and many tons are still available in transformers which are still in service. In fact, PCB cannot be burnt at ordinary flame conditions without serious side effects concerning environment: it needs specialized pyrolysis equipment to completely burn at temperature >20000C. Partly burnt PCBs produce other hazardous chemicals which then go into soil. Let us now dispose what PCB we still have in India (more than 10,000 tons!) in an environmentally safe manner: please do not attempt to burn PCB or throw into soil or water.

How to know if any equipment contains PCBs?
By looking at the nameplates of the equipment for trade name and year of manufacture - if it was manufactured before 1980, it is likely to contain PCB. If no information is available, why take risk? Simply show this hand out to your seniors and request them to contact the organization that eliminates PCB.

By the way, who eliminates PCBs in safely India?
Central Power Research Institute (CPRI), a Govt. of India organization under the Ministry of Power (MOP) is identified by the UNIDO (United Nations Industrial Development Organization) and MoEFCC (Ministry of Environment & Forests and Climate Change (Govt. of India) as a Nodal Agency to take measures in identification of PCBs in the country and take measures to dispose them under an Environmentally Safe Management (ESM) process.

What is the role of CPRI?
CPRI has been identified as the nodal organization in India by MoEFCC (Ministry of Environment and Forest) for developing PCB inventory in India and also for the management of PCBs in India. The GEF-UNIDO had acquired a mobile PCB Treatment System for the disposal of PCB contaminated mineral oil in India. The Government of India and UNIDO have selected the Central Power Research Institute (CPRI) for planning, scheduling and operating this mobile de-chlorination unit. The technology adopted in India for the PCB dechlorination is in line and completely meets the requirement of Stockholm convention on PCBs. For the management services of mobile PCB treatment System in India, UNIDO had signed a contract with CPRI so far using this technology AROUND 450 MT of PCB contaminated oils have been dechlorinated.

Why am I being told about PCBs?
India is a signatory to the international environmental treaty, the 'Stockholm Convention on Persistent Organic Pollutants 'under which it is the moral responsibility of our country to eliminate this toxic and hazardous chemical from the Indian environment. An endeavor is being made through this hand out to reach out to each citizen of the country and to provide awareness about the hazards posed by PCBs so that each one of us may contribute (via giving information and being safe) towards the elimination of this hazardous chemical and so that our children are safe and free from the effects of the hazards of PCBs.

Iam an individual, how can I help?
You can do a lot. You may be a technician or in some way associated with electrical equipment. Even when not working, you may see an old equipment with such a nameplate in a yard or substation. You may then distribute a copy of this handout to a concerned authority. Ensure that you will not handle or touch with bare hands, any oil that may be present in any electrical equipment (such as a transformer) that has been manufactured before 1980. You may even inform your colleague or friend and have a discussion and thereby spread awareness.

How can CPRI tell every person in India that PCBs is hazardous and to be handled in a ESM?
Through communication such as

- Awareness raising program
- Training program
- Through tele-media
- Through sending letters and emails to industries
- Distributing flyers like what you are reading now

What steps are being taken by CPRI to eliminate PCBs completely from the Indian environment?
Visit & Identify PCBs filled equipment in industries; inspect their condition (leaking, stored etc.).
Training field officers in industries to handle PCBs.
Implement destruction or decontamination technology to eliminate PCB completely under an ESM process.

How do we know if any fruit, vegetable or sea food is contaminated with PCBs?
There is no direct method of knowing this. The only way to determine presence of PCBs in a food item is through chemical analysis. Fortunately awareness about PCBs is growing and so far no major issues have been found in the Indian environment due to PCBs.

Any test to know if I am exposed to PCBs?
Doctors can do blood test to evaluate exposure to PCB; blood test is expensive and not always locally available.

What are the safety precautions to be taken in handling PCBs?
Using personnel protective equipment such as gloves, mask, goggles, lab coat, shoes etc.

What to do if a PCBs leak or spill happens?
Rope the area off - only cleanup workers will enter
Use absorbent materials to soak up the spill. Avoid contact with these materials
Do not allow PCBs to enter water drainage system
Use an organic solvent (kerosene, for example) to wipe off smooth hard surfaces of non-disposable objects. Surfaces such as cloth, wood, and concrete absorb PCBs; they cannot be completely cleaned
Dispose of contaminated objects & cleanup materials (rags, absorbent particles, damaged equipment, disposable protective clothing, etc.) by wrapping them in layers of newspaper, then sealing them in thick double- wrapped plastic bags
Contact CPRI for further action

What benefits does CPRI get from this work?

CPRI is a Government of India Organization which will not work for any commercial benefit. CPRI, MoEFCC and UNIDO are working together for a national and global safety and environmental preservation.

Important note to all the PCB stake holders

Any organization containing PCB filled transformer / equipment must practice caution in handling it and take adequate steps towards disposing them with the help of CPRI. Any refill/ disposal / recycling activities must be carried out under the supervision of CPRI.

One Earth, One Family and One Future is the motto. Let us make PCB free Nation. Please support our mission.

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