Polychlorinated Biphenyls (PCBs)

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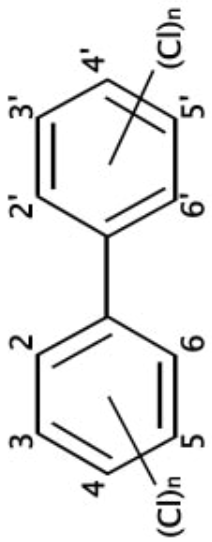

Hemantha Withanage
Chamali Liyanage

Oil leaking old transformer

Centre for Environmental Justice Policy Brief

A hidden killer at the workplace and in environment - Banned but available

Introduction

Used old transformer oil is openly available for [illegal] sale in Sri Lanka. Sometime , welding workers apply leaked transformer oil in the forehead for headache. This is not anything other than PCB contaminated oil. According to the most recent Customs statistics Sri Lanka still import and export large quantities of items contaminated with PCBs.

Monsanto Company, the biggest producer, marketed PCBs under the trade name Aroclor from 1930 to 1977. In 1972, PCB production plants existed in Austria, the then Federal Republic of Germany, France, Great Britain, Italy, Japan, Spain, USSR, and USA. However, due to PCB's toxicity and classification as a persistent organic pollutant, PCB production was banned by the United States Congress in 1979 and by the Stockholm Convention on Persistent Organic Pollutants in 2001.

Polychlorinated biphenyls (PCBs) are a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl, which is a molecule composed of two benzene rings. The chemical formula for PCBs is C12H10-xClx. PCB's (Polychlorinated Biphenyls) are a class of synthetic organic chemicals which are in either oily liquid or solid forms with no discernable taste or odour. PCBs are widely used as a dielectric fluids, because of its low flammability and good dielectric property. They have good insulating properties and are very stable even when exposed to high heat and pressure.

Also they are very stable in changing temperatures because of their low flash point and lack of fire point. Therefore PCB's have a wide variety of applications in transformers, capacitors, cable insulation, switches, oil based paints, adhesives, circuit breakers, pigments, floor wax etc.

The molecular structure is formed by Carbon, Hydrogen and Chlorine atoms. As these atoms can be combined in many different ways, a total of 209 different PCB molecules (congeners) can be formed. When the number of Chlorines in a PCB mixture increases, the flash point also rises and the substance becomes less combustible.

Also, PCBs with large numbers of chlorines are more stable and thus resistant to biodegradation. The toxicity of a PCB is dependent not only upon the number of Chlorines present on the biphenyl structures, but the positions of the chlorine atoms.

For example, congeners with chlorines in both para positions (4 and 4') and at least 2 chlorines at the meta positions (3, 5, 3', 5') are considered to be "dioxin like" and are particularly toxic. When there is just 1 or no substitution in the ortho position, the atoms of the congener are able to line up in a single plane and it is particularly toxic.

Human exposure

The major source of exposure of PCBs today is the redistribution of PCBs already present in soil and water. They can be in the environment such as PCB containing electrical transformers, hazardous waste sites, burning of industrial waste etc. Around 1.7 million tonnes of PCBs were produced between 1929 and 1989 and a lot of the equipment containing PCBs are still in travel and in use somewhere or stocked awaiting final disposal. Therefore continuous exposure of PCBs can be envisaged.

In air, PCBs are broken down by the indirect effect of sunlight and can deposit on land when it rains or snows or when they attach to particulate matter, such as dust or soot that settles on the ground.

Depending on the specific type of PCB, it takes from a few days to several months for half the amount initially present to be degraded. When they contact with an open flame, they produce Dioxins and Furans which are very highly toxic.

PCBs tend not to evaporate or to dissolve easily in water and only a small amount can dissolve in water with most adhering to organic particles (such as compost) and sediments. They therefore bind strongly to soil and persist.

Also PCBs may be ingested when consuming contaminated food or may be inhaled from contaminated hazardous waste sites. Exposure may also occur in workplace environments involved in repair and maintenance of PCB containing instruments.

PCBs stored in a mother's body and released during pregnancy, cross the

Import Statistics of PCB contaminated Transformers, Static Converters and Inductors -

Source: Sri Lanka Customs Department

HS Code	Description	Year/(numbers)			
		2008	2007	2006	2005
8504.10.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	187314	25850	-	-
8504.21.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	4	59	-	-
8504.22.10	Contaminated with or containing Polychlorinated Biphenyls (PCB), not exceeding 2000 KVA	1255659	1812614	1478498	1955618
8504.31.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	38653	25643	-	-
8504.32.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	1707	1550	-	-
8504.33.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	22	900	-	-
8504.40.10	Uninterruptible power suppliers, contaminated with or containing Polychlorinated Biphenyls (PCB)	608487	56332	98700	114814
8504.40.30	Other, contaminated with or containing Polychlorinated Biphenyls (PCB)	377	1906	-	-
8504.50.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	13536	33607	-	-
8504.90.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	54749	18800	-	-
	Total	2160508	1977261	1577198	2070432

placenta and enter the unborn baby. Furthermore, PCBs are excreted in breast milk and this can pass to the child.

PCB travels thousands of kilometers from one ecosystems to another, country to country and ocean to ocean.

Health Hazards

PCB is a carcinogen. The effects vary with the extent of exposure (length of time, etc), the amount of person exposed to (concentration), and the toxicity of the particular PCB that person is exposed to and whether exposure occurs through the lungs (inhalation), mouth (ingestion) or from skin contact.

welders are highly vulnerable to PCB contamination

PCB's bioaccumulate in bodies of human and animals, specially in fat tissues. In humans, the concentration of PCBs in fatty tissues is over a hundred times greater than in the food they eat. Some animal species, including insects and other invertebrates, birds, fish, and mammals, can break down or transform certain PCBs within their bodies.

In human bodies, skin rashes, liver damages, dermal and ocular lesions, irregular menstrual cycles and a lowered immune response and liver damage are some of adverse effects. Some studies in workers suggest PCB exposure may cause nose and lung irritation, gastro-intestinal discomfort, depression and fatigue. Babies born to PCB exposed mothers have various symptoms such as less weight, abnormal responses, problems with motor skills and a decrease in short-term memory.

Export Statistics of PCB contaminated Transformers, Static Converters and Inductors -
Source: Sri Lanka Customs Department

HS Code	Description	Year/(numbers)			
		2008	2007	2006	2005
8504.22.10	Contaminated with or containing Polychlorinated Biphenyls (PCB), not exceeding 2000 KVA	-	456515	433509	631567
8504.31.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	2248291	1512636	-	-
8504.32.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	161	-	-	-
8504.33.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	-	1151	-	-
8504.40.10	Uninterruptible power suppliers, contaminated with or containing Polychlorinated Biphenyls (PCB)	-	-	4219	7887
8504.50.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	-	131024	-	-
8504.90.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	10002	1896	-	-
	Total	2258454	2103222	437728	639454

Re- Export Statistics of PCB contaminated Transformers, Static Converters and Inductors -
Source: Sri Lanka Customs Department

HS Code	Description	Year/(numbers)			
		2008	2007	2006	2005
8504.22.10	Contaminated with or containing Polychlorinated Biphenyls (PCB), not exceeding 2000 KVA	21265	-	-	10
8504.31.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	37228	-	-	-
8504.32.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	2	-	-	-
8504.40.10	Uninterruptible power suppliers, contaminated with or containing Polychlorinated Biphenyls (PCB)	-	16	24	324
8504.40.30	Other, contaminated with or containing Polychlorinated Biphenyls (PCB)	772	-	-	
8504.50.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	102	1	-	-
8504.90.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	-	228	-	-
	Total	59369	245	24	334

Harmonized System code (HS Code) 8504 is described as Electrical Transformers, Static Converters (For Example, Rectifiers) and Inductors. HS Code 8532 – has given for Electrical capacitors, fixed, variable or adjustable and parts thereof. Also there are some other categories which may be considered as PCB containing items under HS Code 2710 – Petroleum oils and oils obtained from bituminous and HS Code 2903 – Halogenated derivatives of hydrocarbons.

Animals that ingest smaller amounts of PCBs in food over several weeks or months develop various health effects, including anemia; acne-like skin conditions, and liver, stomach, and thyroid gland injuries. Rats fed high levels of PCBs for two years developed liver cancer.

The International Agency for Research and Cancer has grouped PCB's in Group 2B Chemicals (a probable carcinogen) because of its toxicity.

Present Situation in Sri Lanka

Sri Lanka was not a PCB producing country. However, Sri Lanka still imports PCB contaminated or containing instruments and appliances. Information in the Customs clearly specify that PCB containing or contaminated electrical transformers, static converters and inductors, electrical capacitors, fixed, variable or adjustable are being imported, exported and re-exported.

The imported amount of PCB containing or contaminated electrical capacitors, fixed, variable or adjustable in 2008 is 4341 kg and in year 2007 it is 17438 kg. From 2008 to 2006, contaminated numbers of imported electrical transformers, static converters and inductors are 2160508, 1977261, 1577198 and 2070432 respectively.

According to the "Preliminary Inventory of Polychlorinated Biphenyls" done by the Ministry of Environment in 2006, there are 1098 transform-

Import Statistics of PCB contaminated Electrical Capasitors -

Source: Sri Lanka Customs Department

HS Code	Description	Year/(kg)			
		2008	2007	2006	2005
8532.10.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	1813	1547		
8532.22.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	2	-		
8532.23.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	-	29		
8532.24.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	42	80		
8532.25.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	-	16		
8532.29.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	368	14019		
8532.30.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	1949	1714		
8532.90.10	Contaminated with or containing Polychlorinated Biphenyls (PCB)	167	33		
	Total	4341	17438		

ers in Sri Lanka contaminated with PCB's at levels higher than 50 ppm . According to the inventory, country will have to have facilities to manage 2292 tons of PCB contaminated oils, when they are ready to be disposed.

The results of the study reveal that 60% of the tested samples proved to be PCB positive and 48% of the transformers manufactured on or before 1986 are contaminated. Unfortunately this contaminated quantity represents 5.78% of the total of 18308 transformers in the year 2005. Also they have identified 4 pure PCB transformers of generation category, which are larger transformers.

Apart from this there are many places in the urban areas that sell transformer oils. Also damaged and abandon old transformers which are submerged in water and ground can be found.

According to a study done by EML in 2004, it has been estimated that Sri Lanka generated 6.25 – 8.00 tons of waste containing PCB, PCT and PBB annually.

Although the prevailing situation of PCB in the country is a grave problem, satisfactory measures have not taken to solve the problem.

Recent Statistics in Sri Lanka Customs

According to statistics available in the Sri Lanka Customs Department there is a heavy traffic of PCB contaminated items in and out. There are some categories and subheadings that describe Contaminated with or containing Polychlorinated Biphenyls (PCB).

HS Code 8504 is for electrical transformers, static converters and inductors. Subheadings under this code categorize either PCB containing or contaminated products that are imported, exported or re-exported.

Tables in this documents provide import, export and re-export statistics from 2005 to 2008.

Policies regarding PCB's

The Stockholm Convention on Persistent Organic Pollutants is a global treaty to protect human health and the environment from chemicals that persist in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and

have adverse affects on human health and the environment.

Sri Lanka ratified the Convention on December 22nd 2005 which covers eight pesticides (Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Mirex and Toxaphene), two industrial chemicals (Polychlorinated Biphenyls and Hexachlorobenzene) and Dioxins and Furans which are produced unintentionally. The Convention addresses the elimination of the use of PCB's in equipment by 2025 and ensuring environmentally sound waste management of liquids containing PCB's and instruments contaminated with PCB's very early not later than 2028.

Also Sri Lanka is a party to the Basel Convention which addresses the trans-boundary movements of hazardous waste and their disposal and ratified to safe handling and disposal of hazardous waste.

Lebelling PCB contaminated equipments

Conclusion

The condition and state of the PCBs in Sri Lanka have to be addressed more widely as this is widespread everywhere. This has to be initiated from the source of importation, i.e Sri Lanka Customs and to the oil selling shops at the ground. In very recent years of 2007 and 2008, importation of PCB containing or contaminated capacitors have increased. It is eveident that Sri Lanka not only import PCB contaminated items for own use but also act as a transit point.

Annually a large quantity is imported and considerable amounts are accumulated in various identified and unidentified areas of the country. Therefore a detailed inventory has to be maintained to determine the contaminated equipment and sites. Also suitable measures have to be adopted for decontamination, treatment and safe storage. Labeling of contaminated or PCB containing equipment such as transformers has to be prioritized.

Transformer dismantling and repairing yards, transformer oil selling points, either small scale or large scale, have to be monitored and highly prioritized. In Sri Lanka, only one laboratory has the proper facility for testing PCB's. Therefore sufficient analyzing facilities, upgrading testing methodologies and equipment to comply with the international standards and skilled technical staff have to be employed.

Interested unbiased parties have to be encouraged to conduct studies and analysis. CEJ tried to carry out some testing of transformer oils in 2007, however, we were not allowed to get the information that we required.

Various industries and companies who import these items probably not aware of the contamination of PCBs. Although they are identified as contaminated, at the Customs, it does not create a favourable step towards the elimination of the toxics. These contaminated items will lie in somewhere in the country at the end of the life cycle.

Ministry of Environment and Natural Resources and the Central Environmnetal Authority are mainly responsible for regulating PCBs. However, according to the government officials, Sri Lanka does not have a policy regulations to ban importation of PCB's. It is not too late even now to introduce a legislation to comply with the Stockholm Convention of which we are a party.

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Centre for Environmental Justice

20A, Kuruppu Road, Colombo 08, Sri Lanka

Tel/ Fax: 0094112683282
email: info@ejustice.lk

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