Case Study of PCB Cross Contamination in Transformers in South Korea

Kim Jong Guk* Park Dong Gyu**

* Jeonbuk National University, ** YS Company



PCBs regulations in KOREA

Year	PCBs Regulation			
1979	Technical Standard of Electrical Equipment Prohibit in using equipment use PCBs-contained insulation oil			
1987	Waste Management Act PCBs standard : 0.003 mg/L, eluate solution			
1993	Revision of the Waste Management Act oil : 50mg/L			
1996	Hazardous Chemicals Management Act Prohibit in manufacturing, importing, selling and using PCBs			
1999	Revision of the Waste Management Act oil : 2mg/L, Others : 0.003mg/L-, eluate solution			
2001	Stockholm Convention			
2005	Occurrence of PCBs contamination problem in transformers			
2007	Ratification of the Stockholm Convention			
2008	Enforcement of POPs management law (Jan, 2008) Starting disposal of PCBs-contained transformers			

Main process for phase out of PCBs

Particular Object

- Identifying the emission sources and establishing a strategy
- Management of PCBs based on risk
- Environmentally friendly PCBs waste disposal
- International cooperation of PCBs problem

Final Goal





PCBs detection rate of over 2 ppm in transformer



manufacture year

Investigation of the cross-contamination route considering the life cycle of insulating oil



Selected manufacturing company with high PCBs detection rate



PCBs Contamination results by company

Type of company	Sample (112)	Detected PCBs (22)	Detected process / place
Transformer manufacture	28	4	New insulating oil Transformer manufacture process
Transformer recycle	11	8	Workstation and waste oil storage tank
Transformer maintenance	5	3	Waste oil storage tank
Insulating oil manufacture	13	0	 New insulating oil → PCBs contaminated insulation oil used in manufacturing new insulation oil
Insulation oil recycle	22	10	 Regenerative cutting oil, refining process, lubricating oil product waste oil storage tank, waste oil refining product

Sources of PCB cross contamination



Analysis & disposal of transformers



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Management of waste transformer

- Attaching a sticker to warn that the recycle/reuse of waste transformer for electrical purpose is prohibited.
- Stored and classified based on the state as below
 - N1, N2 : new product
 - S1, R1, R2 : before analysis \rightarrow unanalyzed transformer
 - R4, R5 : after analysis \rightarrow repair-required transformer
 - S4 : after analysis \rightarrow waste transformer below 2ppm
 - S5, S6 : after analysis \rightarrow waste transformer over 2ppm
- Attaching a notice



recycle/reuse prohibited



over 50ppm



notice for storage house



