



January 10, 2022

EMB MEMORANDUM CIRCULAR

No. 2022 - 01

SUBJECT : GUIDELINES AND RECOGNITION ON THE USE OF CHLORIDE ION SPECIFIC ELECTRODE (CISE) METHOD AS ADDITIONAL TECHNOLOGY OPTION IN SCREENING POLYCHLORINATED BIPHENYLS (PCBs) IN OIL

Pursuant to DAO 2004-01, Chemical Control Order for PCB and Section 3.2.5 of EMB Memorandum Circular No. 2015-007 titled “Technical Guidance Document in Polychlorinated Biphenyls (PCBs) Management,” various PCB screening methods are available in screening materials, equipment, or wastes potentially containing PCBs. These methods include but are not limited to density test and chlorine test. In order to provide technology options in the conduct of screening for polychlorinated biphenyls (PCBs) in oil, the following are the guidelines on the use of the CISE method and its recognition as a method of pre-disposal screening for PCB contaminated oil.

I. OBJECTIVE

This Memorandum Circular is issued to provide guidelines and procedures in PCB sampling and screening using the CISE Method.

II. SCOPE

This Circular shall apply to the sampling and screening of suspected PCB contaminated oil from decommissioned or online Electrical Transformers and PCB equipment.

III. DEFINITION OF TERMS

For purposes of this Guideline, the following terms shall have the following definitions:

- 1) **Dehalogenation** or Dechlorination is a chemical process used to remove halogens (usually chlorine) from a chemical contaminant by hydrogen or a reducing radical containing hydrogen donor.
- 2) **Polychlorinated Biphenyl (PCBs)** is an aromatic compound formed in such a manner that the hydrogen atoms on the biphenyl molecule (two benzene rings bonded together by a single carbon bond) may be replaced by up to ten chlorine atoms. It includes any one of a number of 209 congeners containing 1-10 chlorine atoms attached to a biphenyl group. The compound has CAS Number 1336-36-3 and the DENR Hazardous number L406.



- 3) **PCB equipment** is an equipment containing dielectric oil with PCB concentration equal to or greater than 500 ppm ($\text{PCB} \geq 500 \text{ ppm}$).
- 4) **Transformer** is a device that stabilizes or regulates the supply of electricity.

IV. CHLORIDE ION SPECIFIC ELECTRODE (CISE) METHOD

The CISE method is an indirect method in screening PCB, with the following steps:

- 1) In the first step, which includes extraction and dehalogenation, the PCB or any other chlorinated organic substance existing as a solution in the oil is dechlorinated, and the chlorine detached from the PCB molecule is solubilized in water.
- 2) In the second step, the concentration of chlorine in water is measured by means of a Chloride Ion Specific Electrode (CISE). Then, the chlorine concentration is converted to Aroclor concentration based on the assumption of the presence of a specific Aroclor mixture in the oil.

The current acceptable standard method for PCB analysis in the Philippines is the USEPA 8082. This method may be used to determine the concentrations of polychlorinated biphenyls (PCBs) as Aroclors or as individual PCB congeners in extracts from solid, tissue, and aqueous matrices, using open-tubular, capillary columns with electron capture detectors (ECD) or electrolytic conductivity detectors (ELCD).

The use of the method mentioned above can be used in the characterization of the PCB wastes prior to transport to an accredited Treatment, Storage, and Disposal (TSD) Facility.

V. GUIDELINES AND PROCEDURES

This section is a general procedure for sampling and screening of oil suspected to be contaminated with PCB. The process is composed of two parts. These are sampling, where the oil is extracted from the equipment, and the screening itself, where the oil is analyzed.

A. Sampling

The general sampling procedure will be performed by a company representative or equipment owner. The detailed procedure can be found in *Annex A*. The general procedure is as follows:

- a. Identify the transformer to be sampled and ensure to fill out the sample chain of custody form (*Annex B*);
- b. Manage to put off-line and de-energize the transformer if necessary;
- c. Prepare in advance all the sampling materials, including sampling vials, tubing, labels, waste oil containers, personal protective equipment (PPE);
- d. Wear proper PPE;



- e. Establish proper countermeasures for preventing the contamination of soil underneath the transformer;
- f. Identify and assess the sampling port;
- g. Connect the sampling port with the proper tubing or mount a sampling flange if necessary;
- h. Take and manage the sample;
- i. Manage the waste generated during the sampling; and
- j. Manage to put the transformer back online and repowered (for transformers still in use).

B. Screening

Screening shall be performed by a company representative or equipment owner. The result of the screening is not confirmatory and can be used only to identify PCB-contaminated oil in a specific range. The most reliable range using this method is from 10 ppm – 500 ppm. Readings above 500 ppm should be diluted and measured again, while below 10 ppm can be subjected to confirmatory testing of a recognized laboratory. The following is the general outline of the screening procedure using the CISE method. The detailed procedure can be found in (*Annex C*).

- a. Wear the proper PPE
- b. Set up the Chloride Analyzer
- c. Prepare of the Orion chloride Ion-Selective Electrode
- d. Calibrate the Chloride Analyzer
- e. Perform Electrode stability testing
- f. Extract 5ml of oil sample (taken from the transformer during sampling).
- g. Combine 5ml of oil sample with sodium biphenyl
- h. Add extraction solution into the reaction mixture
- i. Perform phase separation
- j. Perform filtration process
- k. Measure chlorine in the filtered solution
- l. Encode data in the excel conversion template to determine the PCB content.

After the screening using the CISE method, equipment with PCB equivalent to 10 ppm and above is for disposal (pursuant to EMB Memorandum Circular No. 2015-007 titled “Technical Guidance Document in Polychlorinated Biphenyls (PCBs) Management”) (*Annex D– Explanatory Note*). Below 10 ppm may be subjected for further laboratory analysis using the USEPA method. After the confirmatory test and the result is less than 2 ppm, then the equipment is considered PCB-free.

VI. EFFECTIVITY

This Memorandum Circular shall take effect immediately.

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Director

