Abstract No: 102 ***Physical Sciences***

DETECTION OF POLYCHLORINATED BIPHENYLS CONTAMINATED POWER TRANSFORMERS IN SRI LANKA

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Polychlorinated biphenyls (PCBs) classified under persistent organic pollutants are a group I carcinogen. Aroclors were one of the widely used and most reported PCB commercial mixtures globally. Aroclor 1260, Aroclor 1254, Aroclor 1242, and Aroclor 1016 have been used in transformers. Sri Lanka is a signatory of the Stockholm Convention, where PCB usage has been curtailed since 2005. PCBs have mainly been used as insulating oil in transformers and capacitors. The elimination of PCBs by 2025 is a primary goal set by the convention. Accordingly, analysing and inventorying the transformers contaminated with greater than 50 mg kg^{-1} PCBs in Sri Lanka is in progress. This study developed a method based on the ASTM D 4059 to determine the PCB content in insulating oils. PCBs in the sample were extracted with 2,2,4-trimethylpentane followed by interference removal using activated magnesium silicate. The extracted sample was allowed to stand for 10 min to settle the magnesium silicate particles, and 1.0 mL of the supernatant and 0.1 mL of hexachlorobenzene were mixed and analysed with gas chromatography- electron capture detection (GC-ECD). A matrix-matched calibration was used to address the intensity suppression due to the mineral oil, and ratios of uniquely identified well-resolved peaks were used in quantification by adding an internal standard to both calibrators and samples. The Ceylon Electricity Board inventory has more than 30,000 transformers, of which 2,500 were screened as suspected transformers to date. The confirmatory analysis was carried out in 329 samples by GC-ECD. Some of the samples (16.4%) contained total PCBs greater than 50 mg kg^{1}, out of which 16.1% had Aroclor 1260, and 1.5% contained both Aroclor 1260 and Aroclor 1254. The findings will be included in the national inventory facilitating PCB mitigation programs following the Stockholm Convention.

Financial assistance from the Ministry of Environment, Sri Lanka, and UNIDO (Grant No. 150050) is acknowledged.

Keywords: Aroclors, Insulating oil, PCBs, Stockholm Convention, Transformers