

# Development of Simple Method for the Cleaning of PCB-contaminated Transformers

### Background and Objective

PCB contamination in insulating oil for electric facilities such as transformers was made public in 2003. Due to the abundance of contaminated facilities, an effective technique for the removal of PCBs from a contaminated transformer as well as PCB analysis has been required. The major

objectives of this study are the development of a biosensor that can rapidly measure PCBs in oil in a cost-effective manner and a simple process to remove PCBs from contaminated transformers using circulative and energizing cleaning techniques.

### Main results

#### 1 Development of Onsite Measurement Using a PCB Biosensor\*

A prototype vehicle for onsite PCB measurement equipped with analytical instruments was developed (Fig. 1). The time needed to measure the PCB concentration of an insulating oil sample is three hours, and parallel operation

enables the onsite measurement of 60 samples a day. This onsite measurement is useful to assess PCB removal progress from contaminated transformers during the cleaning process.

#### 2 Onsite PCB Removal Experiment for Large-size Contaminated Transformers

Onsite experiments for removing PCBs from a transformer by using circulative and energizing cleaning techniques were carried out in cooperation with 10 power companies, J-Power, and the Japan Atomic Power Company. A prototype mobile facility for the circulative cleaning of large size transformers, with oil capacity between 8 KL and 20 KL, was

developed (Fig. 3). The mobile facility for circulative cleaning was successfully operated at two feasibility test sites. The energizing cleaning test has been undertaken at three sites, and the experimental results are reported to the PCB Treatment Technology Council of the Ministry of the Environment.

#### 3 Confirmation of PCB Removal Efficiency

PCB removal efficiencies in transformers onsite for both the circulative and energizing experiments were evaluated by measuring residual PCBs in assemblies inside transformers

after finishing cleaning. PCB removal rates ranged from 96.2% to 99.7%, demonstrating the high performance of both techniques to remove PCBs in large transformers.

\*Cooperative research with SIBATA Scientific Technology LTD., Sumika Chemical Analysis Service LTD., and Electric Power Engineering Systems LTD., and CERES. INC.

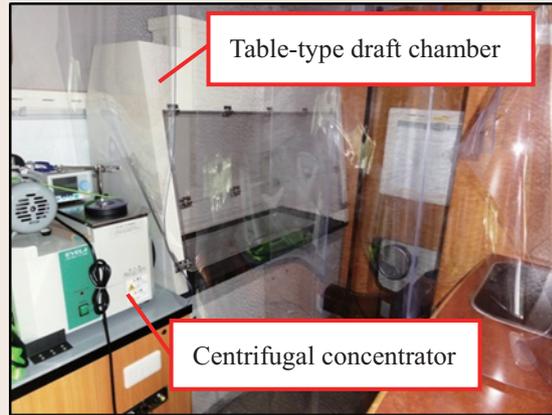


Fig. 1: Prototype vehicle for PCB analysis (left) and analytical instruments inside the vehicle (right)

A centrifugal concentrator, a table-type draft chamber, and a temperature control unit were installed into the vehicle to ensure analytical accuracy matching that of laboratory analysis. Analysis is possible without an external power supply.

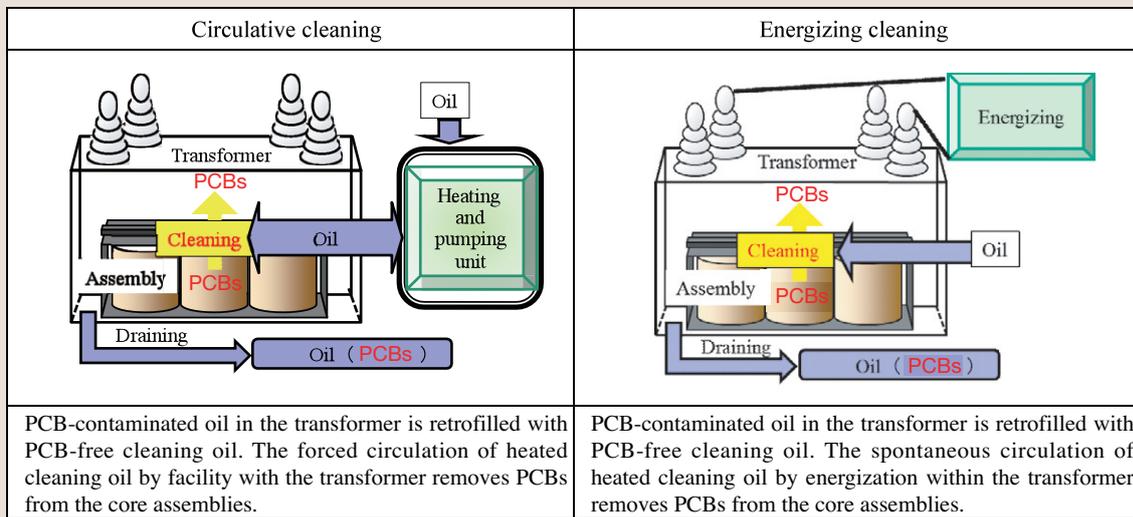


Fig. 2: Image and outline of circulative and energizing cleaning techniques for PCB-contaminated transformers

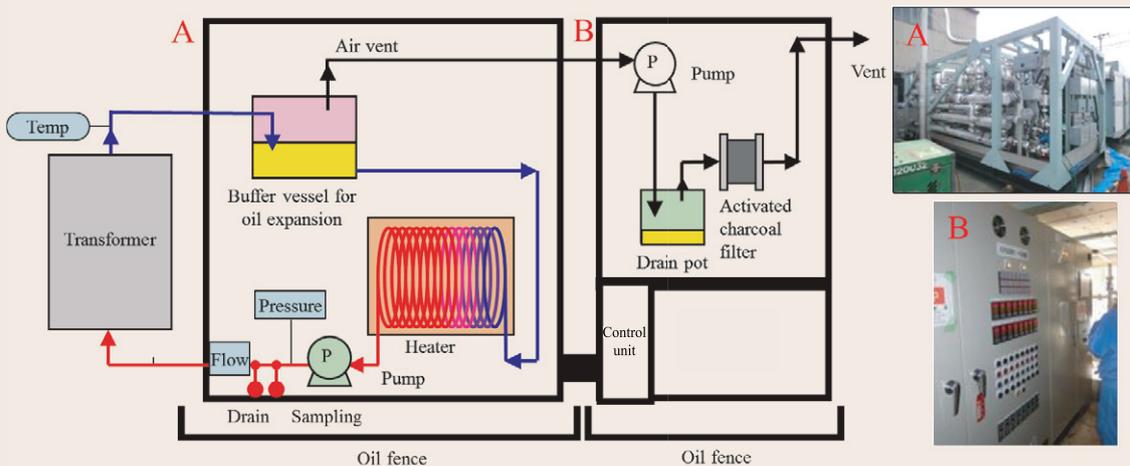


Fig. 3: Prototype mobile facility to remove PCBs by using a circulative cleaning technique

The facility consists of the A and B units. The heating and circulation of cleaning oil with the heater and pump are conducted in unit A. Unit B consists of equipment for monitoring and controlling the flow rate and temperature with vent treatment.