Introduction of Oil Extraction Treatment Services for High-Concentration PCB Equipment

Kaoru Takekawa,
Akinaga Takano

Keyword Environment, Specific chemical substance, PCB, Detoxification, Safety

Abstract

Polychlorinated Biphenyl (PCB) used as insulation oil for transformers, capacitors, and other electrical equipment brought the awareness of a serious problem due to its environmental pollution. In this connection, production and new use of this substance were completely prohibited in 1973.

Since then, moving and the reusing of electrical equipment containing used PCB have been prohibited and business owners are obligated to manage and properly store the related equipment to avoid its negative environmental impact. In July 2001, the Law Concerning Special Measures Against PCB Waste was enacted. Under this law, it stipulates that the PCB waste must be completely eradicated by July 2016.

In order to meet the conditions of receiving PCB at detoxification treatment facilities, we are promoting oil extraction treatment services for PCB equipment and removal services for parts. These services are conducted at the place of PCB storage.

1 Preface

After the outbreak of the incident of the Kanemi rice oil disease, the use of PCB was prohibited in 1973 following the regulations: “restrictions on the use of PCB equipment” and “restrictions on the manufacturing of PCB equipment.” According to the “Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (16 October 1973),” the manufacture, import, and new use of PCB have been totally prohibited, except for part of the facilities. For equipment that contains used PCB, storage and control were dictated by the Electric Utility Industry Law. In accordance with the “Law Concerning Special Measures Against PCB Waste” stipulated in 2001, industrial waste disposal of PCB equipment began to be implemented, but in 2002 some equipment units considered to not contain PCB were found to involve a very small amount of PCB contaminants. When evaporated, PCB generates dioxins and their toxicity seriously affects the human body. Therefore, disposal of PCB substances is being promoted expeditiously worldwide.

Presently, treatments of detoxification for PCB-contained electrical equipment are carried out at five business offices (Hokkaido, Tokyo, Toyoda, Osaka, and Kita-Kyushu) of Japan Environmental Safety Corporation (JESCO). At each business location, however, there are limitations of sizes and mass to meet the official requirements. In order to meet the requirements, oil extraction work and parts removal work must be done for the PCB-contained equipment on the storage site.

Since this work requires the handling of specified chemical substances, we continuously educate workers about the handling of specified chemical substances and provide training for practical work according to manuals. A servicing system to realize safe and assured work has been maintained under the rigorous control of the management system.

This paper introduces oil extraction treatment services for high-concentration PCB equipment that we provide.

2 History

We once manufactured transformers and other equipment using PCB. As a member of JESCO Technical Project, we have been engaged in the education and training of field oil extraction work since 2007.

In regard to parts removal work, the verification

test was carried out in cooperation with JESCO for the work of “removal of flange-connected accessories and lead-through type bushings” for PCB transformers. As a result, we established an effective method for conducting fieldwork.

3 Outline of the Work

3.1 Scope of Treatment (PCB Discrimination)

Since the object of this work is the high-concentration PCB equipment, it is necessary to discriminate in advance if the object equipment contains PCB substances or not. Fig. 1 shows the scope and scale of PCB treatment.

3.2 Discrimination of Working Methods On-Site

If PCB-contained electrical equipment meets the requirements for acceptance at JESCO plant and is transportable from the customer’s location of storage, it is unnecessary to carry out the work for field oil extraction and removal of parts. For large equipment or equipment that may be leaking oil, however, oil extraction work and/or removal of parts are needed.

(1) Large power transformers and others which are difficult to relocate from a place of storage

(2) Large power transformers and others which are difficult to transport to a disposal facility

(3) Large power transformers and others which may not be accepted at a disposal facility

(4) Power transformers and others that require any oil extraction at a location of storage from the risk of the possibility of leakage while removing it or in transport

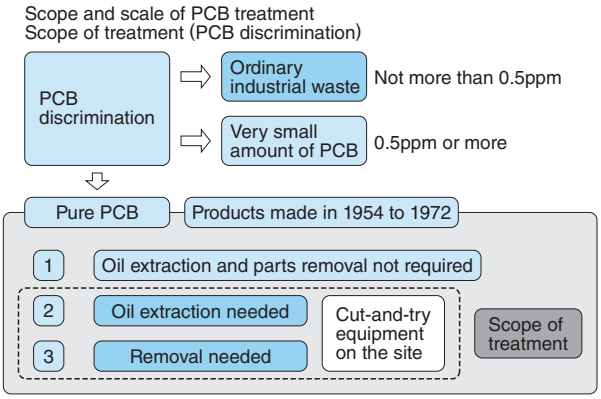

Fig. 1 Scope and Scale of PCB Treatment

A flow chart is shown for pure PCB discrimination.

3.3 Performed Works

3.3.1 Oil Extraction Work on the Site

For field oil extraction work, an exclusive oil extractor specified by JESCO is used to extract PCB oil and puts it into an extractor tank (exclusive oil drums). Fig. 2 shows oil extraction work.

3.3.2 Parts Removal Work

For parts removal work, transformer bushings, conservator, pressure relief device, radiators, etc., are mainly removed so that dimensions and mass can be changed to meet the requirements of acceptance. Workers wear gloves with minimal permeability specified by JESCO so that work can be carried out with minimal impact upon the human body. Fig. 3 shows parts removal work (for a bushing).

We provide education and training of field oil

Fig. 2 Oil Extraction Work

Oil extractor and gloves specified by JESCO are used.

Fig. 3 Parts Removal Work (for a bushing)

Gloves specified by JESCO are used.

extraction work so that work can always be conducted after taking sufficient precautions.

(1) Laws and regulations related to field oil extraction work

(2) Public qualifications that workers are required to acquire

(3) Methods to use oil extractors and various types of protectors

(4) Practical training with the use of simulation equipment

(5) Comprehension check test for the above

Since safety is the first priority during the work, process risk assessment is performed from the preparatory stage of oil extraction treatment before the work commences, to the end of work during instruction. This assessment is intended for the removal of the sources of danger.

From 2008 to the present, we accepted the oil extraction work for 48 transformers including units supplied by other firms. During this work, parts removal work was carried out for 12 units and the total quantity of oil extracted amounted to approximately 101kL.

At each business office of JESCO conducting the detoxification treatment, the total amount of oil extraction and treatment we handled is as follows:

(1) Tokyo Business Office: 80,500L

(2) Toyoda Business Office: 7600L

(3) Osaka Business Office: 12,900L

At two machine storage sites in fiscal 2012, we carried out oil extraction and parts removal for transformers.

4 Postscript

Treatment of high-concentration PCB is important work for the environmental preservation based on the national policy; therefore, we are taking actions with a sense of mission and responsibility. Work in oil extraction and parts removal comes with the handling of specific chemical substances. As such, we are steadily promoting this type of work bearing in mind that safety is a first priority.

We will continue to contribute to the issue of climate change by offering our safe treatment services for our customers.