

PCB TREATMENT AT JAPAN ENVIRONMENTAL SAFETY CORPORATION -A NATIONAL PROJECT OF JAPAN-

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Abstract

Japan Environmental Safety Corporation (JESCO) is assigned to establish and operate PCB treatment facilities in five locations throughout Japan, under the supervision of the central government. Four facilities are currently under operation, beginning with Kitakyushu Facility which opened in December 2004. All JESCO facilities use chemical decomposition methods to treat transformers, capacitors, PCB oil, and ballasts of assigned regions (ballasts are accepted only at Tokyo Facility at the present). JESCO has decomposed a sum total of 294.9 tons of PCB by the fiscal year 2006. Unfortunately, JESCO experienced accidents at Toyota Facility and Tokyo Facility, which resulted in a deep plunge of decomposition amount compared to facility capacities.

It is the task for JESCO to realize stable operation of facilities under operation. Facilities currently under operation or construction are substantially first facilities on practical application of each respective technology. Each facility has to accumulate experience on its operation and management toward completion of treatment within the given period.

Furthermore, JESCO plans to treat PCB contaminated wastes in Kitakyushu project (phase II)(under design) and Hokkaido project (successive phase)(under study). It is necessary to develop the facility by utilizing the findings of past experience, and JESCO will address the PCB issue by attaining safe and sure treatment.

Introduction

Japan Environmental Safety Corporation (JESCO) is a special company wholly owned by the central government. It was established in April 2004 under the "Japan Environmental Safety Corporation Law (Law No.44 of 2003)", to conduct the PCB waste treatment program as principal business activity, succeeded from former "Japan Environment Corporation (JEC)".

JESCO is to establish PCB treatment facilities at five locations nationwide, under the supervision of the central government and under the supervision and direction of the local government at each location, and treat all PCB wastes (besides in-house disposal) stored throughout Japan, by the year 2016, which is the deadline for the disposal of PCB waste, set forth by the "Law concerning Special Measures for Promotion of Proper Treatment of PCB Wastes"¹.

At the present, JESCO treats PCB wastes at four PCB facilities, beginning with Kitakyushu Facility which started operations in December 2004, followed by Toyota, Tokyo, and Osaka Facilities. (See Figure 1 & Table 1)

This paper gives a brief introduction of JESCO's PCB waste treatment program.

Materials and Methods

<Types of PCB wastes treated >

Types of PCB wastes treated at present JESCO facilities are transformers, capacitors, PCB oil and ballasts (ballasts are accepted only at Tokyo Facility at the present). These PCB wastes are given priority for treatment, because they contain a large amount of PCBs per unit, and are massively stored at urban regions. The total amount of PCB wastes to be treated across Japan add up to approximately 14 thousand high-voltage transformers, 265 thousand high-voltage capacitors, 51 thousand other electric equipments, 2 million ballasts (figure includes only ballasts stored at areas assigned to Tokyo Facility) and 1,700 tons of PCB oil.

<Treatment Method>

An outline of treatment methods used at JESCO facilities are shown at Table 2.

All JESCO facilities use only chemical decomposition methods, because they do not produce combustion gases. Tokyo Facility adopts the “hydrothermal oxidation decomposition method”, and the other four facilities adopt the “dechlorination method”.

In accordance with the company policy to carry out PCB waste treatment with priority on safe and reliable treatment and information disclosure, JESCO designs its facilities conforming to the concepts of adopting safe and sure treatment methods, taking multiple safety measures based on the idea of risk management, and disclosing information on treatment status.

When determining treatment method for each facility, experts at the JESCO PCB Waste Treatment Project Exploratory Committee discuss necessary requirements for the facility, considering terms such as types of PCB wastes to treat and geographical constraints. In accordance with the conclusion of Committee discussions, JESCO invites public proposals on concrete treatment methods under WTO rules, and carefully examines proposals from technical aspects and implementation aspects, and finally makes decision on which method to adopt.

Results

The amount of PCB wastes treated at currently operating facilities at JESCO is shown in Table 3. By the fiscal year 2006, JESCO has decomposed 294.9 tons of PCB.

Kitakyushu Facility has treated amounts commensurate with its treatment capacity. Toyota Facility and Tokyo Facility experienced accidents in November 2005 (Toyota), and March / May 2006 (Tokyo), causing small amounts of PCBs to leak, bringing both facilities to halt operations for a long period. Thus the amount of PCB wastes treated at both facilities is far below treatment capacities. Considering these accidents, initial input of PCB wastes for treatment was reduced at Osaka Facility. Confirming the safety, JESCO is gradually increasing input at Osaka.

Discussion

It is the task for JESCO to realize stable operation of facilities under operation. Facilities currently under operation or construction are substantially first facilities on practical application of each respective technology. Each facility has to accumulate experience on its operation and management toward completion of treatment within the given period.

Furthermore, JESCO plans to treat PCB contaminated wastes in Kitakyushu project (phase II)(under design) and Hokkaido project (successive phase)(under study). It is necessary to develop the facility by utilizing the findings of past experience, and JESCO will address the PCB issue by attaining safe and sure treatment.

Acknowledgements

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References

1. Outline of the “ Law concerning Special Measures for Promotion of Proper Treatment of PCB Wastes”: <http://www.jesconet.co.jp/eg/pcbaw.htm> (JESCO’s Website)

Figure 1 Location of JESCO facilities and assigned prefectures

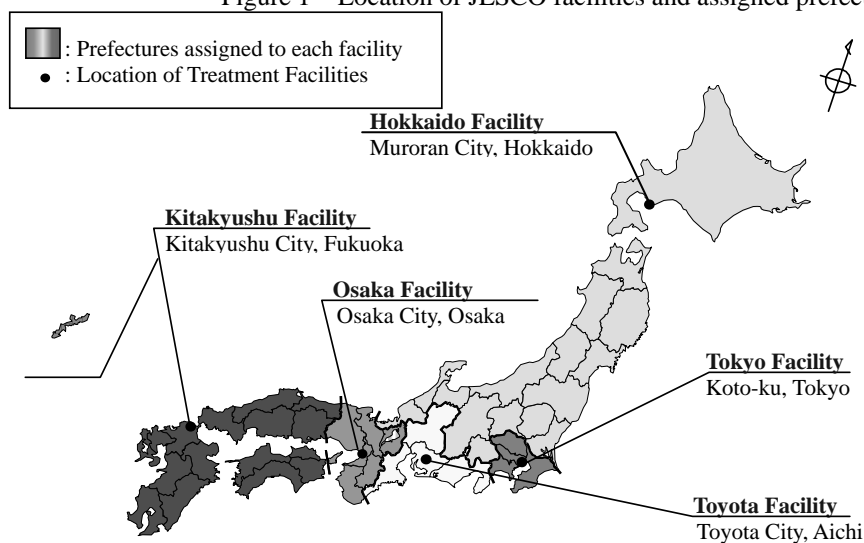


Table 1 Outline of JESCO facilities

Facility	Location	Prefectures assigned	Types of PCB wastes treated	Main Equipment	Capacity (PCB oil)	Start of Operation
Kitakyushu (Phase 1)	Kitakyushu City, Fukuoka	17 prefectures in Chugoku, Shikoku, Kyushu, and Okinawa Regions	Transformers, capacitors, and PCB oil	Reaction Tank:2, Aftertreatment Tank : 2, Solid-liquid separator:1, VTR:1, etc.	0.5 tons/day	December 2004
Toyota	Toyota City, Aichi	4 prefectures in Tokai Region	Transformers, capacitors, and PCB oil	Reaction Tank:2, Reaction Tank for Washing Liquid :2, VTR :4, etc.	1.6 tons/day	September 2005
Tokyo	Koto-ku, Tokyo	4 prefectures in South Kanto Region	Transformers, capacitors, PCB oil and ballasts	Decomposition Reaction Equipment : 3, etc.	2.0 tons/day	November 2005
Osaka	Osaka City, Osaka	6 prefectures in Kinki Regions	Transformers, capacitors, and PCB oil	Intermediate Treatment Line:1, Decomposition Line : 1, Recovery Line:2, VTR:4, etc.	2.0 tons/day	October 2006
Hokkaido	Muroran City, Hokkaido	16 prefectures in Hokkaido, Tohoku, North Kanto, Koushinetsu, and Hokuriku Regions	Transformers, capacitors, and PCB oil	Reaction Tank:2, Aftertreatment Separation Line:2, VTR:4	1.8 tons/day	April 2008 (Scheduled)

Table 2 Treatment methods adopted at each facility (Translated name of Japanese technology is informal)

Facility	Pre-treatment		PCB Decomposition			
	Name of Technology <Company that owns technology>	Name of Technology <Company that owns technology>	Reaction Condition			
			Temperature (degrees Celsius)	Pressure (MPa)	Reaction time (hrs.)	Solvent, etc.
Kitakyushu (Phase 1)	Precise Recovery Cleansing Method <Mitsui Engineering & Shipbuilding Co., Ltd.> Vacuum Thermal Recycling Method (VTR Method)	Sodium Dispersion Method (SD Method) *3 <Nippon Soda Co., Ltd.>	160 to 170	Ordinary Pressure	1 (after dripping activating agent)	Insulation Oil

	<Z.E.R.O. Japan Co., Ltd.>					
Toyota	Solvent Extraction Decomposition Method (SED Method) *1<Kobelco Eco-Solutions Co., Ltd.>	Ontario Hydro Technologies Sodium Dispersion Method (OSD Method) *3 <Nuclear Fuel Industries, Ltd.>	60 to 70	Ordinary Pressure	6	Liquid Paraffin
Tokyo	MHI Chemical Cleansing Method *1<Mitsubishi Heavy Industries, Ltd.>	Hydrothermal Decomposition Method *2 <Mitsubishi Heavy Industries, Ltd.>	About 370 to 380	About 26.5	About 3.5	Auxiliary Agent: NaOH
Osaka	Solvent Cleansing Method <Toshiba Corporation> Vacuum Thermal Recycling Method (VTR Method) <Z.E.R.O. Japan Co., Ltd.>	Catalyst Hydrogenation Dechlorination Method (Pd/C Method) *3 <Kanden Engineering Co., Ltd.>	About 260	Ordinary Pressure	6	Liquid Paraffin
Hokkaido	Solvent Extraction Decomposition Method (SED Method) *1<Kobelco Eco-Solutions Co., Ltd.>	Sodium Dispersion Method (SP Hybrid Method) *3 <Kobelco Eco-Solutions Co., Ltd.>	115 to 120	Ordinary Pressure	3	Liquid Paraffin, Accelerant: IPA

*1 Includes Vacuum Thermal Recycling

*2 Classified as "Hydrothermal Oxidation Decomposition Method" under the Waste Management and Public Cleansing Law (Law No.137 of 1970)

*3 Classified as "Dechlorination Method" under the Waste Management and Public Cleansing Law (Law No.137 of 1970)

Table 3 Amount of PCB waste treated at JESCO facilities

Facility	Fiscal Year	Treated PCB Waste (units)		PCB Decomposition Amount (tons)	Remarks
		Transformers	Capacitors		
Kitakyushu (Phase 1)	2004	30	62	6.2	Capacity (PCB oil): 0.5t/day Capacity (Pre-treatment): Transformers: 1/day, Capacitors: 4/day Start of Operation: Dec. 2004
	2005	238	755	55.8	
	2006	241	1,038	67.7	
	Total	509	1,855	129.7	
Toyota	2005	35	597	26.8	Capacity (PCB oil): 1.6t/day Capacity (Pre-treatment): Transformers: 3.5/day Capacitors: 24/day Start of Operation: Sep. 2005 (Shutdown: Nov. 2005 to Jul. 2006)
	2006	77	1,605	63.7	
	Total	112	2,202	90.5	
Tokyo	2005	95	362	28.8	Capacity (PCB oil): 2.0t/day Capacity (Pre-treatment): Transformers: 1.5/day Capacitors: 25/day Start of Operation: Nov. 2005 (Shutdown: Mar. to Oct. 2006)
	2006	0	46	26.0	
	Total	95	408	54.8	
Osaka	2006	56	1,571	19.7	Capacity (PCB oil): 2.0t/day Capacity (Pre-treatment): Transformers: 2/day Capacitors: 35/day Start of Operation: Oct. 2006
	Total	56	1,571	19.7	
Grand Total	2004	30	62	6.2	
	2005	368	1,714	111.4	
	2006	374	4,260	177.2	
	Total	772	6,036	294.9	