

People's Committee of Hai Phong City
& Hai Phong Urban Environment One
Member Limited Company

Summary Report

Socialist Republic of Viet Nam

Pilot Survey for Disseminating SME's
Technologies for Medical Waste Disposal
System in Hai Phong City

December, 2014

Japan International Cooperation Agency

Irisan Kizai Inc.

1. BACKGROUND

The disposal of medical (infectious) wastes in Vietnam is primarily handled through incineration in hospitals. However, this method presents problems in terms of safety, efficiency, and environmental impact. The Government of the Socialist Republic of Viet Nam issued Prime Minister's Decision No. 170, which principally addresses the disposal of medical (infectious) waste by stipulating a switch from current treatment: incineration within each medical institution (dispersed disposal) to incineration at disposal centers (centralized disposal).

Two methods are being envisioned under 'centralized disposal'; namely, incineration and non-incineration. Although the incineration is the most effective method in terms of 'eradicating sources of infection,' it also requires dealing with the issues of 'cost' and 'air pollution'.

Furthermore, the shift to centralized disposal will require development of a disposal process (i.e., waste collection, transport, incineration, and final disposal) from scratch. This raises questions about not only 'startup costs' and 'operating costs' but also disposal system maintenance.

Additionally, because the shift will require more complex disposal process, the risks of 'contamination' and 'illegal dumping' will become of even greater concern. Consequently, 'rules for appropriate operation' and a 'supervisory mechanism' will be required.

2. OUTLINE OF THE PILOT SURVEY FOR DISSEMINATING SME'S TECHNOLOGIES

(1) Purpose

By providing incinerators based on Japanese technology Irisan Kizai Inc. (hereafter referred to as "Irisan") developed together with Japanese know-how in the field of medical (infectious) waste disposal, the Survey will be implemented to verify the effectiveness of a medical waste disposal system to be suited to resolving issues on medical (infectious) wastes in Vietnam and then disseminate Irisan's incinerators and Japanese know-how of medical waste treatment to concerned parties in Vietnam.

(2) Activities

1) Verification

- ① Incinerator installation and operational guidance for medical (infectious) waste disposal
- ② Improvement and development of proper medical (infectious) waste disposal system.
- ③ Measuring environmental impact and evaluation of economic efficiency of the

developed medical (infectious) waste disposal system and.

2) Dissemination

Briefing for central and local government personnel

It will be invited concerned personnel from the central government and major local governments to a briefing to be held in Hai Phong City in order to share the results of the verification activities for approximately six months. It will be presented Japan's medical (infectious) waste disposal systems and the results of the verification including a tour of the verification site. It will serve as a means of promoting understanding of the system with an eye to its dissemination.

(3) Information of Product/ Technology to be Provided

Proposed product: Specialized incinerator for disposal of medical (infectious) wastes with 4 tons/day capacity

Incinerators incorporating Iriisan's technologies reduce fuel consumption by one-half compared to existing incinerators in Vietnam, as they also meet Japan's high exhaust emission standards, by eliminating the need for an auxiliary burner in the primary combustion chamber.

The burner that forms the main component of the incinerator will be procured in Japan, while the furnace and other parts of the structure will be produced in Vietnam. This approach will lower initial costs of the incinerators whose operating performance is compliant with Japan's strict environmental standards.

Incinerators for industrial wastes, including medical (infectious) wastes, are products with designs and specifications that are matched to specific burning materials. Accordingly, the incinerator to be used in this Survey will employ a design and materials that are suitable, in particular, for medical wastes.

Proposed technology: Medical waste disposal system (by private enterprise and government)

In Japan, in order to reduce illegal dumping of infectious waste improved disposal systems have been established by employing manifest systems, preparing infectious waste disposal manuals, and providing government-led guidance and supervision as well as education systems. At the same time, fierce price competition is spurring private enterprises to develop more highly efficient systems.

(4) Counterpart Organization

- ① People's Committee of Hai Phong City

Chairman: Mr. Duong Anh Dieu

Office: No. 18 Hoang Dieu St., Hohg Bang Dist., Hai Phong City

Tel: (84-08) 031212 Fax: (84-31) 3842368

② Hai Phong Urban Environment One Member Limited Company

Director: Dr. Le Ngoc Tru

Office: No. 1 Ly Trong Str., Hai Phong City

Tel: (84-31) 3746399 Fax: (84-31) 3823542

(5) Target Area and Beneficiaries

① Hai Phong City, Vietnam

② Medical institutions in Hai Phong City and residents in the vicinity of disposal facilities

(6) Duration

From August, 2013 to December, 2014

(7) Progress Schedule

Activities to be implemented during the Survey are as follows:

1) Incinerator manufacture and installation (April to November, 2013)

① Determination of incinerator specifications, detailed design, and components procurement

② Discussions with Hai Phong Urban Environment Company and concerned parties about appropriate actions concerning permits and licenses for installation and operation

③ Support from Irisan for Hai Phong Urban Environment Company to acquire permits and licenses for installation and operation of incinerator through executing survey on surrounding environment and preparation of documents based on the survey results

④ Export of components from Japan

⑤ Transport and installation in Vietnam

2) Construction of buildings and ancillary facilities (August to November, 2013)

The following activities shall be executed in parallel with those of 1) above:

① Determination of specifications and design

② Component procurement and construction

- 3) Trial operation and operational guidance (onsite work) (December 2013 to February 2014)

In cooperation with Hai Phong Urban Environment Company, Irisan will execute a trial operation of the installed incinerator, make adjustments to correct problems, and take necessary actions in response to environmental measurements.

Irisan will also provide instructions on incinerator operations to employees of Hai Phong Urban Environment Company through the trial operation process.

- 4) Improvement and firm establishment of the medical waste disposal system (transfer of Japanese know-how and experience) (September 2013 to February 2014)

The following activities shall also be executed in parallel with those of (1) to (3) above:

- ① Supply of information concerning technologies and know-how for infectious waste disposal in Japan
- ② Study of possibilities for introducing Japanese technologies and know-how based on onsite observations and dialogue
- ③ Proposals for improvement plan of existing disposal system in Vietnam
- ④ Verification of implementation conditions and evaluation of improvement plan

- 5) System demonstration (March to August, 2014)

Hai Phong Urban Environment Company will operate the medical waste disposal system that was built by Irisan for approximately six months as a demonstration.

- ① Preparation of a measurement plan
- ② Execution of measurements
- ③ Analysis and evaluation of measurement results

- 6) Holding of a seminar based on demonstration results (April to November, 2014)

- ① Planning
- ② Preparation of seminar materials
- ③ Gathering of participants and holding of the seminar
- ④ Evaluation of seminar results

- (8) Manning Schedule

The personnel plan of this project will be as follows.

Figure 1: Personnel plan

Charge	Name	Organization		2013					2014												Total		
				8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	Local	Dome	
Project Management	Akihiro Uenishi	Irisan kizai K. K	Local	5				5			4				5			8			27		
			Dome	2	3			2			2			2	2		1	2	2	2		20	
Incinerator manufacture	Toshikazu Okumura	Irisan kizai K. K	Local	6	13	10	10	11	10	7	9	4			8		3	9			100		
			Dome																			0	
Incinerator manufacture	Nguyen Pham Quoc Bao	IRISAN VIETNAM CO., LTD	Local	6	13	10	10	11	10	7	9	4			8		3	9			100		
			Dome																			0	
Chief Advisor. Planning for Seminar	Seiji Aikawa	Aikawa Asia Business Consulatnts	Local	5				5				5			5			8			28		
			Dome								1	1		1	1	1	1					6	
Planning for Seminar	Tran Thi Ngoc Lieu	Aikawa Asia Business Consulatnts	Local	4		4	5	7		5		6	1		6	2	2	8			50		
			Dome																			0	
the Medical waste Disposal System	Katsu Saiki	Hamagin Research Institute. Ltd.	Local	5	5		5			5		5			5			8			38		
			Dome		5	5	5		5		6							7	7	7	5		52
the Medical waste Disposal System	Fukushima prefectural office personnel	Fukushima Prefectural Government	Local		5													8			13		
			Dome		1	1	1	1									3					7	
the Medical waste Disposal System	Hidetomo Ito	Kitakanto Messcude K. K.	Local		5		5			5								8			23		
			Dome		1	1	1	1									3					7	
												Ordering company								Man・month Total		227	20
												External talented people								Man・month Total		152	72
																	Man・month Total			379	92		

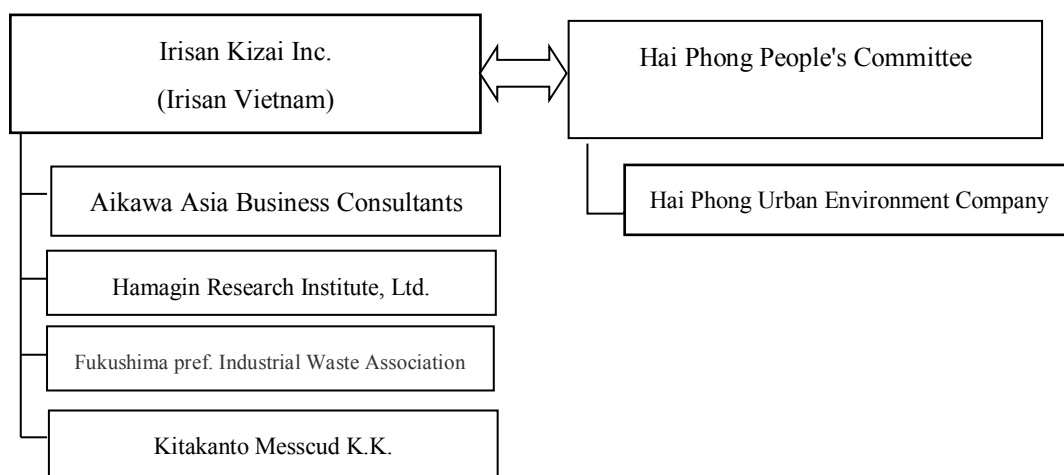
(9) Implementation System

1) Survey implementation structure

① Survey implementation structure

The Survey implementation structure will be as follows:

Figure 2: Implementation system for the Survey



② Allocation of responsibilities

Responsibilities will be allocated among parties concerned with the project as follows:

Figure 3: Division of responsibilities for the project

	Organization	Allocated responsibilities
Contracted companies	Irisan Kizai Inc.	- Overall project management - Guidance for incinerator manufacture, installation, and operation - Assistance in completing procedures for permits and licenses for incinerator installation and operation - Operation and management of the demonstration
	Aikawa Asia Business Consultants	- Advice concerning overall project management - Planning of the seminar to be based on the demonstration - Supplementary support for the medical waste disposal system (Japanese know-how and experience)
	Hamagin Research Institute, Ltd.	- Supply of information on medical waste disposal systems and compilation of technical guidance - Supplementary support for operation and management of the demonstration
	Fukushima pref. Industrial Waste Association	Provision of information and technical guidance on medical waste disposal systems (from the standpoint of government-led direction and management)
	Kitakanto Messcud K.K.	Provision of information and technical guidance on medical waste disposal systems (know-how and experience) (from the standpoint of collection)
Implementing organizations in partner country	Hai Phong People's Committee	- Project management on the Vietnamese side - Coordination with concerned organizations
	Hai Phong Urban Environment Company	- Completion of procedures for permits and licenses for incinerator installation and operation - Execution of the demonstration (collection and disposal of medical wastes) - Reporting at the seminar to be based on the demonstration

3. ACHIEVEMENT OF THE SURVEY

(1) Outputs and Outcomes of the Survey

1) Manufacture of the incinerator

- ① Acquisition of permits and licenses for incinerator manufacture and installation
(August 2013 to January 2014)

Irisan began the work of designing and manufacturing an incinerator in August of 2013. During this time, it also supported Hai Phong Urban Environment Company to apply for incinerator installation. Permission for installation was received in December of 2013.

After permission was obtained, Irisan began transporting materials to the site in Hai Phong City at the end of December 2013 and then, onsite assembly. Installation was completed in mid-January 2014.

- ② Trial operation and operational guidance (January and February 2014)

Trial operation of the incinerator began in late January 2014. As part of this trial operation, Irisan provided guidance on operation to employees of Hai Phong Urban Environment Company and made adjustments to the incinerator.

2) Improvement and final establishment of the medical waste disposal system (October and November 2013)

- ① Supply of information concerning technologies and know-how for medical waste disposal in Japan

Mr. Kimura of the Fukushima Industrial Waste Association provided information on laws, ordinances, and other regulations concerning disposal of medical (infectious) waste in Japan; collection and disposal of such waste and administrative supervision of those activities to Hai Phong Urban Environment Company as well as the Department Natural Resources and Environment and Department of Health of Hai Phong City.

- ② Provision of technologies and know-how based on observations and dialogue

Mr. Saeki of Hamagin Research Institute, Ltd., and Mr. Ito of Kitakanto Messcud K.K. observed the site for medical (infectious) waste collection and disposal and engaged in dialogue with concerned personnel.

A comparison of collection and disposal methods between Hai Phong Urban Environment Company and Japan was conducted based on the results of on-site observation and dialogue above mentioned and shed light on the following issues within Hai Phong Urban Environment Company:

- Stabbing accidents are likely to occur as workers take hold and carry bags containing medical (infectious) waste when loading or inserting waste, removing ash, etc.
- Because containers are not well sealed, the risk of odors and leaks during transport and work is high.
- Collection by vehicle takes place only before noon. The existing vehicles have been prohibited to access into the city center during the daytime due to traffic restrictions.
- The size of containers is too large (70 liters) to load medical waste currently generated. It leaves unused spaces inside the vehicle that reduce loading efficiency.

It was recommended that the following steps employing Japanese know-how could be applied to resolve these issues.

- Use of highly stab-resistant gloves
- Use of fully sealable containers with high loading efficiency (with a volume of around 20 liters)
- Increasing operating hours of the vehicles or introduction of new vehicles (small vehicle)
- Automation of insertion work and improvement of ash-removal procedures

Of these recommendations, “automation of insertion work and improvement of ash-removal procedures” has been adopted in the process of the incinerator’s installation under the survey. However, the other recommendations have not been realized since those improvements will require time and money.

3) Facility demonstration (March to June, 2014)

Hai Phong Urban Environment Company began demonstration tests of medical (infectious) waste incineration in March 2014. It measured the following items during the survey.

① Environmental impact

On a total of four occasions, three prior to implementation of verification activities (January 21, February 14, and February 24, 2014) and one during executing verification activities (April 19, 2014), the company took measurements of items required by environmental laws and ordinances in Vietnam (specifically, exhaust, water supply, water drainage, incineration ash, surrounding air quality, water quality of nearby rivers, and soil quality in the vicinity). All resulting values passed the latest environmental standards for medical (infectious) waste incinerators in Vietnam.

Thus, Irian's incinerator consequently became the only one incinerator in Vietnam that meets those standards as of the end of October 2014.

② Gathering of information for evaluation of economic efficiency (March to June, 2014)

Hai Phong Urban Environment Company recorded operational conditions, amounts of waste handled, consumption of fuel and other consumables, work hours, and other items during the verification of incinerator operation (demonstration).

During the demonstration, the company collected between 600 and 700 kg/day of medical (infectious) waste and processed it by operating the incinerator for seven to eight hours per day on 13 days per month.

In order to handle the rapidly increasing amount of medical (infectious) waste being generated in Hai Phong City (estimated to reach about four tons per day after seven years), it was decided that the incinerator to be installed would have a design capacity of four tons per day (envisioned operation of 20 hours per day) based on an incinerator service life of around 10 years.

During the demonstration period, fuel consumption was between 25.3 and 32.9 liters per hour (average of 28.9 liters per hour), as the incinerator's operating time reached only approximately 40% of its design capacity (20 hours/day) for the reasons given above. Thus, it did not attain the design fuel consumption of 20 liters per hour. However, given that old incinerator used prior to the incinerator for this survey consumed about 50 liters of fuel per hour, the demonstration incinerator's successfully reduced fuel consumption by roughly half.

Incinerators consume the most fuel at the start of burning when the internal temperature is getting high. Consequently, longer continuous operation results in correspondingly lower per-hour fuel consumption. Accordingly, fuel consumption will approach its planned level as the amount of medical (infectious) waste generated increases and continuous operation times grow longer in the future.

4) Holding of a briefing (October 21 and 22, 2014)

A briefing to present the results of the demonstration was held in Hai Phong City. The briefing was co-organized by the Ministry of Natural Resources and Environment, Hai Phong People's Committee, and JICA Viet Nam Office.

A total of 77 people from the central government (among them personnel from the Ministry of Natural Resources and Environment, Ministry of Planning and Investment, and Ministry of Health), local governments, and other bodies participated. Persons concerned with the project provided a summary of the demonstration as well as reports

on the incinerator's technologies, economic efficiency, and environmental impact. A tour of the incinerator facility by participants was also conducted.

The briefing fostered better understanding of how Irian's incinerator can effectively solve the problem of medical (infectious) waste disposal in Vietnam among the participants.

(2) Self-reliant and Continual Activities to be Conducted by Counterpart Organization

Since the demonstration's conclusion, the incinerator for medical (infectious) waste that was installed through the survey continues to be used for the disposal of such waste by Hai Phong Urban Environment Company.

During the survey's implementation period, Hai Phong Urban Environment Company obtained the permits and licenses that were required to continuously operate the installed incinerator as demonstration equipment. Moreover, Irian provided technical guidance on the incinerator's operation and maintenance to the company's workers.

Given the above, appropriate and more environment-friendly disposal based on proper maintenance and management as outcomes of the survey will be done continuously even after the survey completed. .

4. FUTURE PROSPECTS

(1) Impact and Effect on the Concerned Development Issues through Business

Development of the Product/ Technology in the Surveyed Country

Irian established a local affiliate in Vietnam that has been manufacturing and selling industrial waste incinerators since 2013. This affiliate has received five orders of industrial waste incinerator as of the end of October 2014.

Through the implementation of this survey, it has been confirmed that medical (infectious) waste incinerators that utilize Irian's technologies can help solve the problem of medical (infectious) waste disposal in Vietnam. Therefore, the affiliate plans to sell incinerators for medical (infectious) waste to local governments if they wish to purchase the medical (infectious) incinerator.

However, medical (infectious) waste incinerators are expensive because they require high-priced raw materials and sophisticated technical equipment in order to meet Vietnam's strict standards. Thus, it has been concluded based on a study conducted as part of the survey that local governments will have difficulty purchasing incinerators with their own financial resources alone.

Given this, Irian is working to lower the price of its incinerators by, among other

measures, raising the percentage that is manufactured in Vietnam. On the other hand, it has been learned that Vietnam's Ministry of Natural Resources and Environment is requesting grant aid from the Government of Japan to promote installation of the incinerators. Through these two directions, Irisan will continuously support local governments and other bodies that wish to install Irisan's medical (infectious) waste incinerators.

(2) Lessons Learned and Recommendation through the Survey

The Hai Phong People's Committee was extremely proactive and cooperative with regard to Irisan's proposal from the very beginning. This kind of preparedness to actively receive outside proposals if they serve to resolve local problems is driving current development in Hai Phong City. Moreover, Hai Phong Urban Environment Company has a highly capable management team and is providing precise operational training to its workers. Believing that these organizations would be capable of appropriately managing and effectively utilizing its incinerator, Irisan executed the project based on an agreement that these two organizations would serve as the counterpart organization and local partner organization, respectively. Consequently, permits and licenses were acquired, training on operation by workers was provided according to plan, and the demonstration was concluded without a major accident, malfunction, or other problem.

To achieve further improvements in medical (infectious) waste disposal systems in Vietnam through the continued and effective utilization of the incinerator installed by the survey, the survey team recommends that the Hai Phong People's Committee and Hai Phong Urban Environment Company continue studying the following points.

① Study of possible contribution to other hazardous wastes through incineration

As mentioned above, the volume of medical (infectious) waste being generated in Hai Phong City is growing rapidly. The incinerator was designed with disposal capacity considering the amount of waste expected to be generated in about seven years under the conditions that the incinerator's service life (about 10 years) and other factors.

However, at the present time, only about 600 to 700 kg of medical waste is being collected per day, and therefore, the incinerator is operating at no more than about one-fifth of its full capacity. Since there are needs to appropriately dispose of other hazardous wastes, the team recommends that the counterpart organizations study co-incineration in order to utilize current excess capacity. If such mixed incineration can be realized, it could lead to the installation and effective utilization

of the cinerator that was demonstrated in the survey in regions that currently produce comparatively low amounts of medical (infectious) waste but are expected to increase the amount in the future. This would contribute toward the introduction of incineration disposal in other cities.

② Ensuring the safety of workers by introducing Japanese safety measures

In Japan, various approaches are taken with regard to the containers and gloves used and work procedures in order to prevent workers' infection through stabbing accidents. Although the inclusion of such safety measures was studied and proposed in this survey, the proposal for improvement was not employed due to economic difficulties and other considerations at the present time.

However, because ensuring worker safety is an important topic, the team recommends to the introduce measures proposed based on know-how in Japan when conditions in the economic environment allow.

OUTLINE OF THE SURVEY

