Pilot project for the environmental technology verification

In the field of VOC treatment technology

(Treatment technologies for organochlorine degreasing agents such as dichloromethane)

Protocol for the verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane

Oct. 8, 2004

Environmental Management Bureau,

Ministry of the Environment

Table of Contents

Main section

I. Introduction

1. Target technologies

VOC treatment technologies (Treatment technologies for organochlorine degreasing agents such as dichloromethane) covered by this pilot project are those (equipment, etc.) that can be installed later to properly treat waste gas from organochlorine degreasing agents such as dichloromethane, types of VOCs, used to degrease or clean metals in the metal processing or plating industry, by adsorption, cold condensation, liquid absorption, or other methods (hereinafter referred to as dichloromethane, etc. treatment technologies).

Incineration is another possible technology for treating dichloromethane, etc. but the pilot project in this fiscal year focuses on technologies for recovering dichloromethane, etc. in light of the demand for them. Other technologies will be studied in the next and subsequent fiscal years. Thus, this protocol for the verification specifies only the procedures for verification tests on technologies for recovering dichloromethane, etc.

Fig. 1 Images of Target Technologies

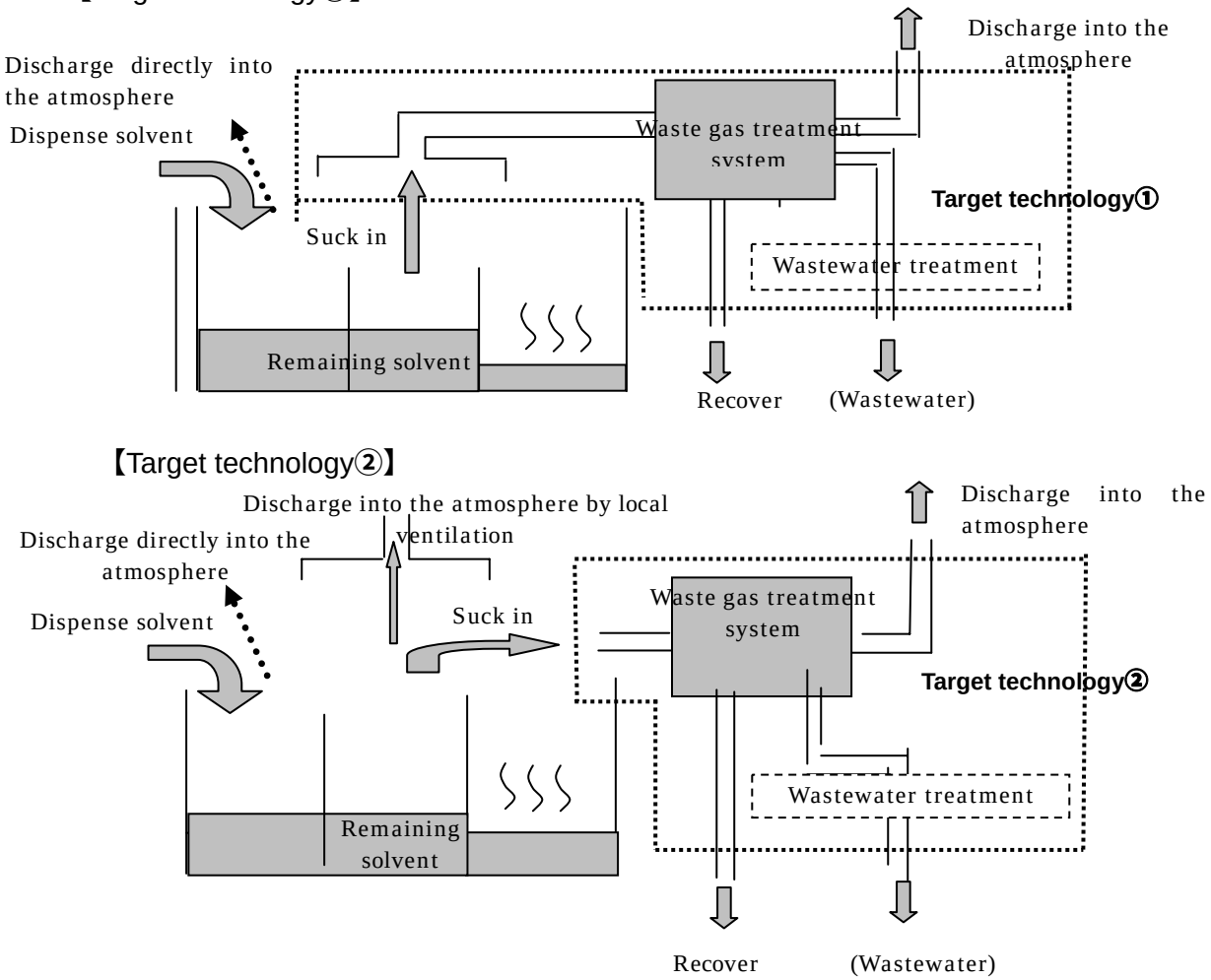


Figure 1 shows images of the target technologies. This protocol targets two technologies: solvent recovery equipment installed in place of local ventilation equipment, which is now commonly used

(target technology (1)) and solvent recovery equipment used in combination with local ventilation equipment (target technology (2)).

2. Types and outline for verification tests

(1) Types of verification tests

This verification test is intended to test treatment technologies developed by environmental technology developers and evaluate the test results. In this verification text, the following items will be verified for target verification apparatuses:

- Environmental protective effect under practical operational conditions in the range specified by an environmental technology developer
- Energy, materials and cost required for operation
- Operational environment allowing normal operations
- Labor for operations and maintenance (hereinafter referred to as the “O&M”)

(2) Outline of verification testing process

The verification test will mainly be conducted according to the steps specified below:

i Planning

The plan for the verification test (hereinafter referred to as the “Test Plan”) will be prepared before the test is conducted. The Test Plan will be prepared by a Verification Organization in cooperation with an environmental technology developer.

The main activities in the planning stage are as follows:

- Specifying the individuals and organizations involved in the test
- Specifying the general and technology-specific objectives of the test
- Specifying verification items
- Determining analytical and data measurement methods and the test period
- Establishing a Test Plan that includes specific procedures, a schedule, and the individuals in charge, based on the results of the above items

ii Verification test

In this stage, a verification test will be conducted according to the Test Plan described above. The verification test verifies the conformity of a target verification apparatus with its objectives specified in the planning stage. The Verification Organization may, if necessary, subcontract part of the verification test to external test organizations.

iii Data assessment and reporting

In the final stage, all data collected will be analyzed for verification, and a report on the verification test (hereinafter referred to as the “Verification Report”) will be compiled. A Verification Organization is responsible for analysis of the data and reporting. To accelerate the above process, the Verification Organization may subcontract an external organization to prepare a draft of the Verification Report.

The Verification Report will be submitted by the Verification Organization to the Ministry of the Environment. The suitability of the verification tests in the report will be discussed by the working group on the VOC treatment technology (hereinafter referred to as the “working group”) of the committee on the pilot project for the environmental technology verification. After being approved by the Ministry of the Environment, the report will be disclosed to the public through a database on environmental technology managed by the Ministry of the Environment.

3. Definitions of terms and phrases

The definitions of the major terms and phrases are in accordance with those of the Japanese

Industrial Standards (hereinafter referred to as “JIS”). The standards in JIS particularly relevant to this protocol for the verification (hereinafter referred to as “Protocol”) are as follows:

JIS B 8330 “Testing methods for turbo-fans”

JIS B 8530 “Glossary of terms for pollution control equipment”

JIS K 0050 “General rules for chemical analysis”

JIS K 0095 “Methods for sampling of flue gas”

JIS K 0102 “Testing methods for industrial waste water”

JIS K 0114 “General rules for gas chromatographic analysis”

JIS K 0123 “General rules for analytical methods in gas chromatography mass spectrometry”

JIS K 0125 “Testing methods for volatile organic compounds in industrial water and waste water”

JIS K 0211 “Technical terms for analytical chemistry (General part)”

JIS K 0214 “Technical terms for analytical chemistry (Chromatography part)”

JIS K 0215 “Technical terms for analytical chemistry (analytical instrument part)”

JIS K 0804 “Gas detector tubes (length-of-stain type)”

JIS K 1474 “Test methods for activated carbon”

JIS K 5601-2-1 “Testing methods for paint components”

JIS Z 8731 “Acoustics - Description and measurement of environmental noise”

JIS Z 8808 “Methods of measuring dust concentration in flue gas”

In addition, the terms and phrases used in this Protocol are defined as set forth in Table 1.

Table 1 Definitions of terms and phrases used in this Protocol

Term/Phrase	Definition
Target verification technology	Method for treating organochlorine degreasing agents such as dichloromethane to be verified in the verification test. The target verification technology should have a clear scientific basis.
Dichloromethane, etc.	Dichloromethane, trichloroethylene, tetrachloroethylene (In this verification test, either dichloromethane or trichloroethylene shall be used in view of the amounts to be used in actual processes.)
Target verification apparatus	An apparatus to be used in the verification test among the apparatuses / equipment representing the embodiments of the target verification technology
Verification items	Items to be analyzed for determination of the performance of a target verification apparatus
Test Site	An establishment where a target verification apparatus is to be installed and the verification test is to be conducted
Verification applicant	A person wishing to have his/her own technology verified. If the applied technology is selected as a target verification technology, the verification applicant will be referred to as an “environmental technology developer.”
Environmental technology developer	A person who possesses a target verification technology. Until the applied technology is selected as a target verification technology, the person is referred to as a “verification applicant.”

II. Verification test system

1. Ministry of the Environment

- Comprehensively administer the entire pilot project for the environmental technology verification
- Comprehensively discuss the verification test system
- Select target verification technology fields for the verification test
- Establish and administer the committee on the pilot project for the environmental technology verification and its working groups
- Create a protocol for the verification
- Select Verification Organizations
- Financially support Verification Organizations by bearing the expenses relevant to the verification tests
- Approve target verification technologies
- Approve reports on verification tests
- Create an Environmental Technologies Verification database (hereinafter referred to as “ETV database”) for their dissemination

2. The committee on the pilot project for the environmental technology verification

- Offer advice on the management of the entire pilot project for the environmental technology verification
- Offer advice on the comprehensive evaluation of verification of test results

3. Working group on the VOC treatment technology

- Offer advice on management of the entire pilot project for the environmental technology verification in the fields of ethylene oxide treatment technologies and VOC treatment technologies (Treatment technologies for organochlorine degreasing agents such as dichloromethane)
- Offer advice on creating a protocol for the verification
- Offer advice on the selection of Verification Organizations
- Offer advice on approval of the Verification Report

4. Verification Organizations

- Administer the verification test under the auspices of the Ministry of the Environment
- Construct the quality management system shown in Appendix 0
- Invite the public to register the technologies and products that are suitable as targets of the verification tests
- Establish and administer respective Technology Panels
- Establish a Test Plan in cooperation with environmental technology developers
- Conduct and manage the target verification tests based on the Test Plan
- Ensure the health and safety of all persons relevant to the verification tests at the Test Sites
- Set and adjust the test schedule by assuring the means of communication among all participants in the verification test, and providing transportation assistance and technical advice as necessary
- When the verification test is subcontracted to an external organization, ensure that the

quality management system, which is required in the Protocol, is indeed functioning properly at the subcontractor

- Audit the procedures for the verification test
- Perform monitoring, measurement, and analysis under the auspices of the Ministry of the Environment
- Manage the data / information obtained in the verification tests
- Prepare the Verification Report based on analysis of the data on the verification test

5. Technology Panels

- Offer advice on the selection of target verification technologies
- Offer advice on the Test Plan
- Offer advice on the problems that may occur during the verification tests
- Offer advice on the issuance of the Verification Report
- Offer advice on dissemination of the technologies verified in the verification test

6. Environmental Technology Developers

- Cooperate with Verification Organizations in the establishment of the Test Plan, such as by providing information required for the verification test
- Provide as many target verification apparatuses that can be used at the Test Site as required. In addition, provide the Verification Organization with its “O&M manual”
- Bear the costs and responsibility for the transportation, installation, removal, and others of the target verification apparatus as necessary
- Bear, in principle, the costs for O&M of the target verification apparatus. In addition, bear the costs for chemicals, supplies, and utilities that may be additionally required.
- Provide technical support to the Verification Organization by assisting in the operation and measurement of the target verification apparatus during the verification test period, if necessary
- Provide engineers for O&M of the target verification apparatus, if necessary. The engineers should be properly qualified or experienced and have received adequate training.
- Provide existing relevant performance data for the target verification technology if it has been tested at other sites
- Cooperate with the Verification Organization in preparing the Verification Report

III. Selection of target verification technologies

1. Application

A verification applicant may apply to a Verification Organization for verification of the applicant's proprietary technology / product. Items to be specified in the application form are described below. The verification applicant should fill in the necessary information in the "Application form for verification" set forth in Appendix 1, and submit the application form together with the designated documents to the Verification Organization.

a. Company name, Address, Division of person in charge, Name of person in charge, etc.

b. In-house test results

c. Product data

d. Developmental status and past delivery record

e. Other relevant or unique features (if any)

f. Technical specification* for the target verification apparatus

g. O&M manual*

(Note) The documents designated with * should be attached to the application form.

2. Selection of target verification technologies

Based on the description of the application and the advice from the Technology Panel, a Verification Organization selects target verification technologies and obtains approval from the Ministry of the Environment. The selection criteria are as follows:

a. Technological requirements:

- Does the applied technology fall under the technology of the target verification technology fields described in "1. Target technologies" on page 1?
- Is the application form properly filled in?
- Is the technology at a commercialization stage?

b. Possibility of verification

- Is it possible to complete the verification from cost and organizational standpoints?
- Is it possible to establish a suitable Test Plan?

c. Environmental protective effect, etc.

- Is it possible to scientifically explain the principle and mechanism of the technology?
- Is there any possibility of the technology causing environmental side effects?
- Does it provide a high environmental protective effect?
- Is it an innovative technology?

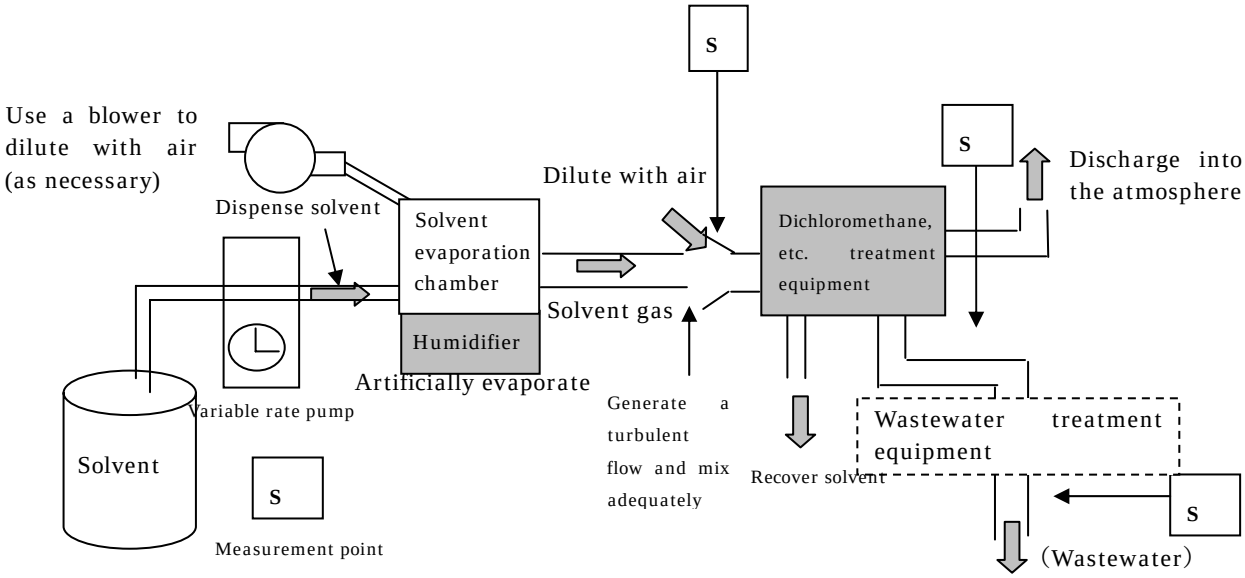
In the selection stage, a verification applicant can confer with the Verification Organization concerning the specific methods of verification, including the period and date of tests.

IV. Preparation for the verification tests

1. Determination of verification items

This verification test uses gas artificially generated from solvent (organochlorine degreasing agents such as dichloromethane). Thus, the effects of evaporation of solvent induced by excessive air volume, mixing of grease from metal, and other factors assumed under actual use conditions cannot be evaluated.

Figu.2 Image of Equipment under Test (Example)



(1) Verification items regarding waste gas treatment performance

The possible verification items regarding the waste gas treatment performance to be examined in the verification test are summarized in Table 2. Data to be collected for reference is given in Table 3. In addition to the test items specified above, the Verification Organization examines the necessity for other verification items and describes all of the verification items regarding waste gas treatment performance in the Test Plan.

Table 2 Verification items regarding waste gas treatment performance

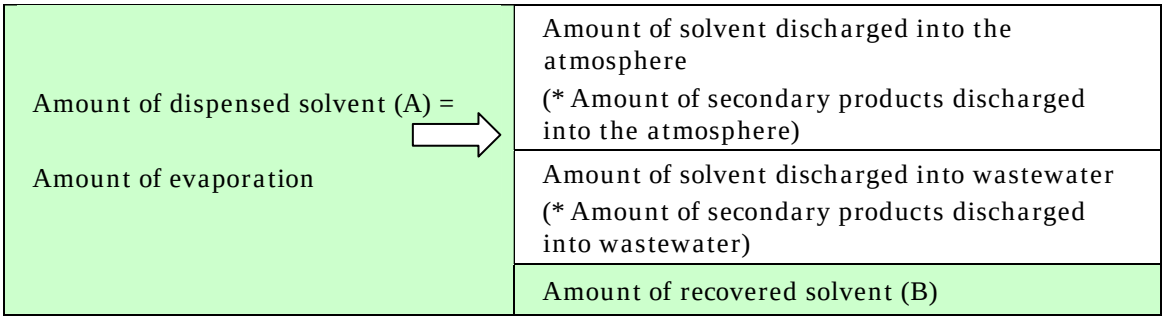
Test items	Description
Concentrations of dichloromethane, etc.	Concentrations of dichloromethane, etc. at the inlet and outlet ducts of dichloromethane, etc. treatment equipment. Also determine the concentration of the solvent, etc. at the outlet duct when the equipment is not in operation.
Recovery rate	Amount of dichloromethane or other solvents dispensed (total amount of the solvent put in dichloromethane, etc. treatment equipment) and solvent mass balance calculated from the amount of recovered solvent

Table 3 Referential measured data

Test items	Description
Properties and components of recovered solvent	Changes seen in solvent recovered through dichloromethane, etc. treatment equipment (purity and other properties)

* Test conditions to be recorded, such as temperatures and flow rates, are described on page 13.

Fig.3 Image of waste gas treatment performance



* Recovery rate = (B) / (A)

* Some treatment principles may cause degradation or chemical reaction, producing secondary products.

* These items assume that gas is artificially generated from solvent. They do not assume that components other than those of the dispensed solvent, including additive agent components, may be mixed into the solvent gas.

* If technologies other than those for recovering solvent are covered by verification tests in the next and subsequent fiscal years, rates of treated solvent, which are calculated by the formula of (A – (Amount of solvent discharged into the atmosphere)) / (A) will be added as a verification item.

(2) Verification items regarding environmental load

The possible verification items regarding environmental load to be examined in the verification test are summarized in Table 4. In addition to the test items specified above, the Verification Organization examines the necessity for other verification items and describes all of the verification items regarding environmental load specified in the Test Plan. The results of the verification test on noise are handled as reference data.

Table 4 Verification items regarding environmental load

Category	Verification items	Description	Major relevant cost
Environmental impact	Condition of wastewater generation	Concentration of solvent, COD, and BOD in wastewater produced when equipment is in operation and not in operation (in post-processing, etc.) and amount of wastewater	—
	Condition of secondary product generation	Production of secondary products in waste gas (outlet gas) and wastewater produced when equipment is in operation or not in operation (in post-processing, etc.)	Disposal cost
	Condition of waste generation	Production of waste solvent and other waste when equipment is in operation or not in operation (in post-processing, etc.)	Disposal cost
Reference item	Noise	Noise level during operation of the apparatus (main unit)	—

(3) Verification items regarding operations and maintenance

The verification items presumably required for quantitative and qualitative evaluation of the performance in and cost for O&M are summarized in Table 5. In addition to the test items specified above, the Verification Organization examines the necessity for other verification items and describes all of the verification items regarding O&M determined in the Test Plan.

Table 5 Verification items regarding operations and maintenance

Category	Verification items	Description	Major relevant cost
Electricity use and material consumption	Electricity consumption	Electricity consumption per operation (kWh/operation) (The definition of one operation is described in Figure 4.)	Cost for electricity consumed when equipment is in operation
			Cost for electricity consumed when equipment is not in operation (in post-processing, when solvent is recovered, etc.)
	Fuel consumption	Fuel consumption per operation (if a fuel such as town gas, LPG, or the like is consumed)	Cost for fuel consumed when equipment is in operation
			Cost for fuel consumed when equipment is not in operation (in post-processing, when solvent is recovered, etc.)
	Water consumption	Water consumption per operation (if water is consumed for treatment, cooling, and others)	Cost for water consumed when equipment is in operation
	Other chemical consumption such as reactant	Chemical consumption per operation (if activated carbon, chemicals, etc. are used) and frequency of replacement	Cost for water consumed when equipment is not in operation (in post-processing, when solvent is recovered, etc.)
O&M performance	Number of operators, and the level of operator skill required for O&M of the target verification apparatus	Maximum number of operators and working days (man-day) for each operational item The technicality and difficulty of O&M shall be described.	—
	Evaluation of O&M manual	Readability, understandability, and problems	—

(Items to be described as reference data in the report)

O&M performance	Restrictions on Installation site	Requirements of degreasing equipment to which the equipment under test can be attached, weight load (when installed on a roof), etc.	—
	Measures against electricity failures and emergency situations	Measures in the event of power failure, ease of and problems involved in restoring from problems, etc.	—
	Measures in the event of ignition or other risks	Whether or not measures against ignition due to overheating following solvent adsorption heat are put in place	—
	Consistency of the treatment performance	Deterioration in treatment performance over extended use, possibility of corrosion, etc.	—

2. Establishment of the Test Plan

The Verification Organizations establish the Test Plan based on information provided by the environmental technology developers and the advice of the Technology Panel. If the environmental technology developers do not give approval for the Test Plans, the Verification Organizations will consult as required with the Ministry of the Environment to determine the necessary actions.

The items to be included in the Test Plan are listed in Appendix 2.

V. Verification test methods

1. Operations and maintenance

The target verification apparatus should be inspected periodically and kept in a suitable condition in order to maintain stable operation and thereby ensure proper operation and increase the efficiency of operation throughout the test period. Regardless of whether the Verification Organization or another organization is responsible for the O&M, all procedures involving inspection, O&M should be adjusted in advance by the Verification Organization, described in the Test Plan, and confirmed by the parties concerned.

(1) Regular operations and maintenance

- O&M to ensure proper operation of the target verification apparatus during the test period should be performed in accordance with the O&M manual.
- Calibration should be performed in accordance with the O&M manual. Calibration should also be performed at least as frequently as specified in the O&M manual.
- In selecting the verification items regarding O&M, the problems that may arise when an operator is not sufficiently capable of conducting O&M should also be considered.

(2) Actions in the event of disruption in conditions

The Verification Organization will inform the environmental technology developer as soon as possible in the event of disruption in conditions. The Verification Organization should take actions for restoring the apparatus to stable operation specified by the environmental technology developer. In the event of unforeseen circumstances, the Verification Organization will take actions together with the environmental technology developer.

The data obtained under the disrupted conditions will not be used in the statistical analysis for the Verification Report, but shall be described and analyzed in the Verification Report. As soon as stable operation is resumed, alternative measurements will be made.

The conditions, cause and result, and method for resumption under disrupted conditions shall be described in the Verification Report. When the cause is unclear or it is not possible to judge whether the conditions are indeed unusual, the data obtained during the period is used in the statistical analysis for the Verification Report.

The Verification Organizations should install experimental apparatuses that are modified to ensure the safety of the experimental environment and the operators, even if such modifications may lead to inadequate operation or inadequate performance of the target verification apparatuses.

(3) Cost estimation

The Verification Organizations will collect and sort the data required for cost estimation for O&M, such as costs required for post-processing, power costs, costs of disposing of secondary products, and consumable costs, in cooperation with the environmental technology developers.

2. Test conditions

(1) Setting for test conditions

A verification test of a dichloromethane, etc. treatment technology shall be conducted by infusing a target verification apparatus with solvent gas that reproduces gas patterns of dichloromethane, etc. from degreasing equipment.

In light of the practices of small- and medium-sized plating businesses, settings for the conditions of this test assume that degreasing equipment with an opening area of 0.5 to 1.5 m^2 is manually operated. Verification Organizations shall consider more detailed test conditions in view of the actual use conditions of degreasing equipment in establishing a Test Plan.

- Environmental technology developers shall select either dichloromethane or trichloroethylene as a solvent used in the verification tests.

- Verification Organizations shall select commercial dichloromethane and trichloroethylene solvents generally used in degreasing processes.
- Gas to be infused into a target verification apparatus shall be artificially generated using a solvent evaporator that simulates waste gas generated from degreasing processes in a triple degreasing tank (Figure 2). Fed with solvent in amounts given in Figures 5 and 6 by a variable rate pump, the solvent evaporator shall supply solvent gas by heating and vaporizing the solvent.
- Solvent gas shall be sucked into a target verification apparatus while being diluted with room air by a blower. Dilution ratios are decided by air volumes for sucking in solvent gas, which Verification Organizations shall decide in consultation with environmental technology developers.
- Solvent shall be supplied by a variable rate pump in two patterns: pattern A with small pulsations and long batch time that assumes degreasing of plated products with a large surface area, and shows low peak concentrations relative to the peak bottom width (Figure 5), and pattern B with large pulsations and short batch time that assumes degreasing of plated products with a small surface area, and shows high peak concentrations relative to the peak bottom width (Figure 6). Verification Organizations shall perform a single operation for patterns A and B as shown in Figure 4.
- The numbers of batches to be repeated in a single operation shown in Figure 4 are set to grasp the waste gas treatment performance, environmental effects, and resource consumptions when the equipment is operated for one day or 24 hours. Verification Organizations shall take this point into consideration in establishing a Test Plan.
    - For example, if twin-tower absorber equipment is used, running-in is required to reproduce conditions when operation is finished on the previous day or to reproduce the absorbing tower loaded with solvent. This shall be taken into consideration in establishing a Test Plan.
    - Similarly, if processes other than absorption and other processes when the equipment is in operation, including post processes (desorption, etc.), are required, these processes shall also be covered by verification tests, and environmental load or resource consumptions in these processes shall also be recorded as appropriate. In this case, process times shall be allocated appropriately in one-day operation.
- If these patterns cannot be applied because of the special characteristics of a target verification apparatus, Verification Organizations may make changes to the patterns in an appropriate range.
- Verification Organizations shall keep temperature, humidity, and other test conditions in test rooms as constant as possible, in order to prevent differences in test environments between test periods or test sites.
- The entire system including wastewater treatment equipment is considered as a target verification apparatus. Thus if wastewater treatment is required, wastewater produced as a result of treatment shall also be monitored (if gas discharged following aeration in wastewater treatment equipment is returned to the solvent treatment equipment (absorbing tower, etc.), the concentration of solvent in waste gas from the outlet of the equipment shall be determined).

Table 6 Test patterns for waste gas treatment tests using a dichloromethane, etc. degreasing simulator

Pattern	Total amount of dispensed solvent	Batch time	Description
A	About 3.2 mol/batch	20 minutes	Characterized by small pulsations (long batch time and low peak concentrations relative to the peak bottom width)
B	About 3.2 mol/batch	10 minutes	Characterized by large pulsations (short batch time and high peak concentrations relative to the peak bottom width)

Fig. 4 Number of batches to be repeated in two test patterns

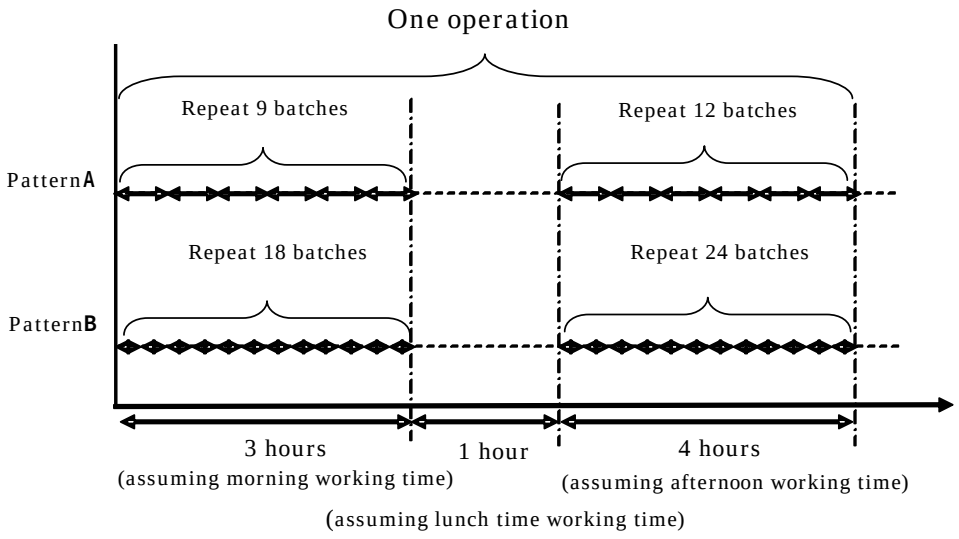
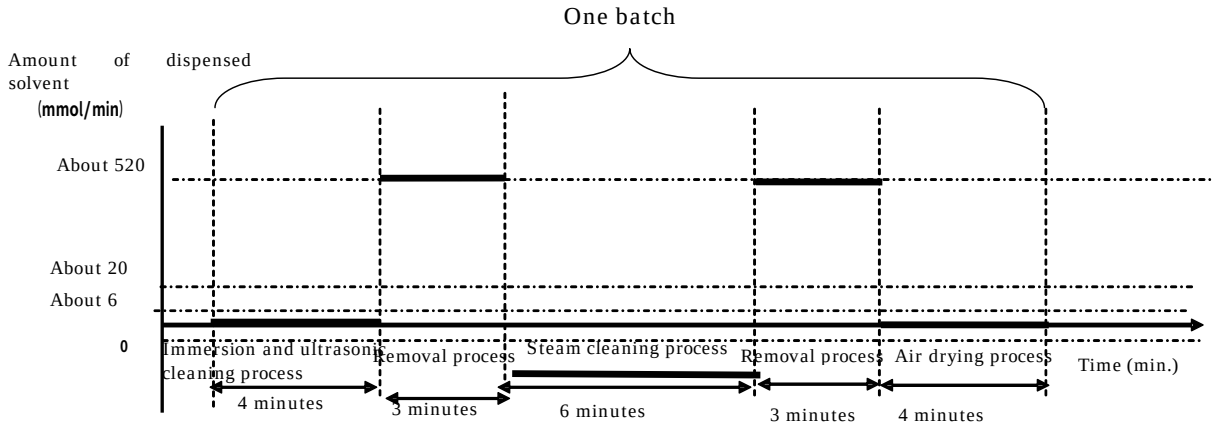


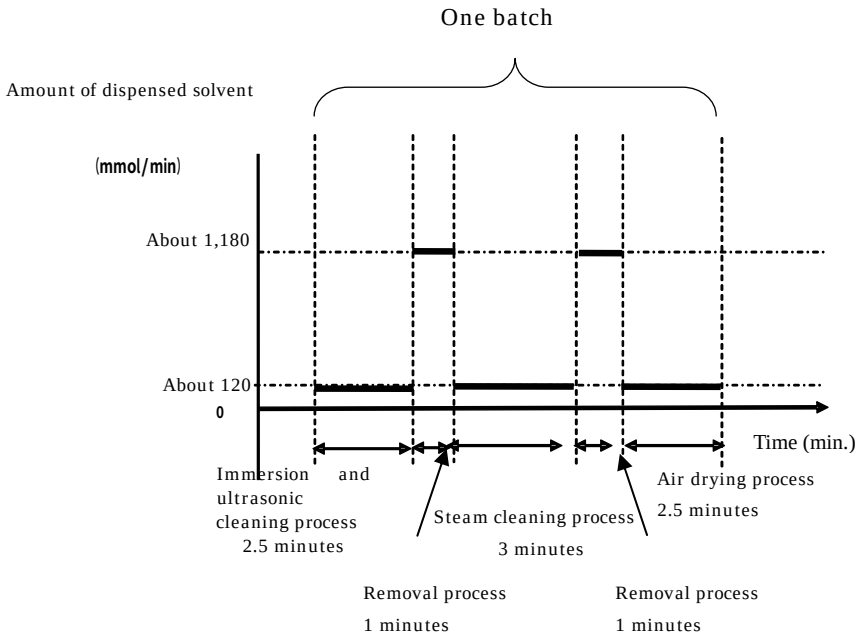
Fig. 5 Overview of pattern A



Process	Time (min.)	Amount of dispensed solvent
Immersion and ultrasonic cleaning	4	About 6
Removal	3	About 520
Steam cleaning	6	About 20
Removal	3	About 520
Air drying	4	About 8

* Molecular weight of dichloromethane: 84.9, molecular weight of trichloroethylene: 131.4
* The concentration of solvent in the inlet of treatment equipment is decided by the air volume set by the environmental technology developer.
* The peak concentrations of solvent in the inlet of treatment equipment are about 25,000 ppm and about 250 ppm at rates of 0.5 m^3/min. and 50.0 m^3/min., respectively.
* For target technology (2), solvent shall not be dispensed in the air drying process.

Fig.6 Overview of pattern B



Process	Time (min.)	Amount of dispensed solvent (mmol/min.)
Immersion and ultrasonic cleaning	2.5	About 120
Removal	1	About1,180
Steam cleaning	3	About 120
Removal	1	About1,180
Air drying	2.5	About 120

* Molecular weight of dichloromethane: 84.9, molecular weight of trichloroethylene: 131.4
* The concentration of solvent in the inlet of treatment equipment is decided by the air volume set by the environmental technology developer.
* The peak concentrations of solvent in the inlet of treatment equipment are about 56,600 ppm and about 570 ppm at rates of 0.5 m^3/min. and 50.0 m^3/min., respectively.
* For target technology (2), solvent shall not be dispensed in the air drying process.

(2) Test conditions to be recorded

The Verification Organizations shall record the following parameters and describe them in the Verification Report. Temperature shall be measured continuously using a thermocouple, and humidity shall be measured using a dry and wet bulb hygrometer. Flow rates shall be measured with reference to Table 7.

- Temperature and humidity of room air (around the area where solvent gas is diluted)
- Flow rate and humidity in the inlet and outlet of dichloromethane, etc. treatment equipment
- Components of the commercial solvent (contents of additives, etc.)

Table 7 Method for measuring flow rates

Test condition	Method
Flow rate	Flow velocity of waste gas shall be measured continuously using a pitot tube or a thermal anemometer. The measurements shall be multiplied by the duct cross-sectional area to calculate flow rates. (i) Measurement of flow velocity using a pitot tube $V = C \times (2P_d/\gamma)^{1/2}$ $\gamma = \gamma_0 \times \{273 / (273 + \theta_s)\} \times \{(P_a + P_s) / 101.3\}$ $P_d = P_1 - P_s$ V: Flow velocity (m/s) P_d: Dynamic pressure of waste gas (Pa) γ: Density of waste gas (kg/m^3_N) θ_s: Temperature in the measuring system (°C) P_a: Atmospheric pressure (Pa) γ_0: Density of waste gas (kg/m^3) P_s: Static pressure (pressure in the measuring system: Pa) P_1: Total pressure (pressure to push against fluid (confining liquid) in the measuring system: Pa) (ii) Calculation of the flow rate of waste gas $Q = A \times V \times \{273 / (273 + \theta_s)\} \times \{P_s / 101.3\} \times 60$ Q: Flow rate of waste gas (m^3_N/min.) V: Section area of the duct (m^2)

3. Measurement methods

(1) Measurement methods for verification items regarding waste gas treatment performance

The measurement methods for the verification items regarding waste gas treatment performance are summarized in Table 8.

Measurement methods for items other than the test items specified below shall be specified in the Test Plan with reference to the relevant JIS standards and regulations.

Table 8 Measurement methods for verification items regarding waste gas treatment performance

Measurement items	Method
Concentrations of dichloromethane, etc.	A continuous total hydrocarbon analyzer shall be used to measure the concentrations of dichloromethane, etc. in the inlet duct of the target verification apparatus. A continuous total hydrocarbon analyzer shall be used to measure the concentrations of dichloromethane, etc. in the outlet duct of the target verification apparatus. The “Manual for Measuring Designated Substances in Waste Gas” (Air Pollution Control Division, Air Quality Bureau, Environment Agency, Apr. 1997) shall be followed to make measurements, if the Verification Organization finds that necessary. Concentrations in the outlet duct shall also be measured when the equipment is not in operation as required.
Recovery rate	A recovery rate shall be calculated from the amount of solvent dispensed in a single operation and the amount of recovered solvent. A constant rate pump or an electronic balance shall be used for measurement of the amount of dispensed solvent, and an electronic balance for measurement of the amount of recovered solvent.

Table 9 Measurement methods for reference data

Test items	Description
Properties and components of recovered solvent	The purity of recovered solvent and the composition of impurities in it shall be determined according to JIS K 5601-2-1 (Testing methods for paint components).

(2) Measurement methods for the verification items regarding environmental load

The measurement methods for the verification items regarding environmental load are summarized in Table 10.

Measurement methods for items other than the test items specified below shall be specified in the Test Plan with reference to the relevant JIS standards and regulations. The Verification Organizations should describe the measurement items and measurement methods in the Verification Report.

Table 10 Measurement methods for the verification items regarding environmental load

Category	Verification items	Method
Environmental impact	Production of wastewater	Refer to JIS K 0125 (Testing methods for volatile organic compounds in industrial water and waste water) and JIS K 0102 (Testing methods for industrial waste water).
	Production of secondary products	Appropriately set by the Verification Organization
	Production of waste products	Appropriately set by the Verification Organization
Reference item	Noise	Determine with reference to JIS Z 8731 (Acoustics – Description and measurement of environmental noise). When a blower is built in, determine the noise with reference to JIS B 8330 (Testing methods for turbo-fans). The detailed measurement conditions shall be set by the Verification Organization and described in the Test Plan.

(3) Measurement methods for the verification items regarding operations and maintenance

The measurement methods for the verification items regarding operations and maintenance are summarized in Table 11.

The unit prices for estimation of the cost of electricity, water, and others shall be set appropriately by the Verification Organizations.

The Verification Organizations should describe the measurement items and measurement methods in the Verification Report.

Table 11 Measurement methods for the verification items regarding operations and maintenance

Category	Verification items	Method
Electricity use and material consumption	Electricity consumption	Determine from the value of the current integrators in all apparatuses when equipment is in operation and not in operation.
	Fuel consumption	Appropriately set by the Verification Organization.
	Water consumption	As above
	Other chemical consumption such as reactant	As above
O&M performance	Number of operators and the level of operator skill required for O&M of the target verification apparatus	Evaluate based on the results of actual operation.
	Evaluation of O&M manual	Evaluate based on the results of actual use.

(Items to be described as reference data in the report)

O&M performance	Installation site constraints	Requirements of degreasing equipment to which equipment under test can be attached, weight load (when installed on a roof), etc. shall be presented by the environmental technology developer.
	Measures in the event of power failure or other problems	Evaluate measures to combat a power failure based on the test results submitted by the environmental technology developer. Specifically, evaluate measures (1) when the target verification apparatus is shut down by a power failure and (2) when power supply is resumed. Check ease of restoring from problems in the O&M manual and the results of actual operation.
	Measures in the event of ignition or other risks	Check whether or not measures to combat ignition due to overheating following solvent adsorption heat are put in place in the O&M manual and the results of actual operation.
	Consistency of the treatment performance and necessity for recovery of chemicals	Deterioration in treatment efficiency over extended use, the life of chemicals or catalysts, and necessity for recovery of chemicals shall be presented by the environmental technology developer. Measures for corrosion control or longer operating life, if any, shall also be checked.

4. Management of analytical accuracy

In order to ensure accuracy at a certain level in measurement of the targeted substance, the data should be managed properly during the entire test period, from sampling to analysis and quantitation. Conduct management to ensure analytical accuracy with reference to the “Manual for Measuring Designated Substances in Waste Gas (Environment Agency),” which specifies the methods for measuring trichloroethylene, tetrachloroethylene, and benzene in waste gas.

VI. Preparation of the Verification Report

The results obtained in the verification test shall be reported in the Verification Report. All data, including the results of the verification test for the period from startup to the end of operation, all actions taken for O&M, and any changes during the test period, shall be described in the Verification Report.

The Verification Report shall contain the following:

- Executive summary (Refer to Appendix 3.)
- Introduction and background
- Overview of the target verification technology and apparatus
    - Principle and configuration of the target verification technology
    - Specifications and capacity of the target verification apparatus
- Manufacturer of product (Name, address, TEL)
- Serial number
- Method and conditions of the verification test
    - Schedule of the entire verification test
    - Conditions of the verification test and test equipment
    - Verification items regarding waste gas treatment performance (method and date)
    - Verification items regarding environmental load (method and date)
    - Verification items regarding O&M (method and date)
- Results and discussions of the verification test (The results of measurements and analysis shall be shown in tables and graphs.)
    - Verification items regarding waste gas treatment performance
    - Verification items regarding environmental load
    - Verification items regarding O&M
    - Records of measurement processes (conditions of sampling, etc.)
- Appendix
    - Quality control of data
    - Auditing of the quality management system

The Verification Organization prepares a draft of the Verification Report and, after obtaining the consent of the environmental technology developer concerning the description and discussions by the Technology Panel, finalizes the Verification Report. The Verification Report submitted to the Ministry of the Environment shall be discussed by the working group and approved by the Ministry of the Environment.

VII. Remarks in conducting the verification test

1. Quality control of data

(1) The method for quality control of data

The quality of data obtained on the verification items should be managed in accordance with the method specified in Section V. Verification test methods, 4. Management of analytical accuracy.

(2) Measurement and data acquisition

For quality control of data, the following requirements should be given during measurement and data acquisition:

- Any assumptions on which the Test Plan is based, as well as all measurement locations and samples to be collected there, should be reported to and approved by the Technological Panel during design of the Test Plan.
- Any non-standard data measurement methods and equipment or analytical methods and instruments that may affect the representativeness of data should be validated and documented.
- All analytical methods and instruments used should be documented.
- The requirements for the calibration of all analytical instruments and procedures, including the calibration standards, should be specified in the Test Plan.
- Any type of data not obtained by measurement, such as that obtained through interviews and the like, should be examined to determine the limits of its use.

2. Management, analysis, and presentation of data

The data obtained in the verification test includes quantitative data such as verification data on the consistency of waste gas treatment performance, as well as qualitative data such as that on the reliability and operability of the system and operators demands. The methods for management, analysis, and presentation of these data are as follows:

(1) Data management

Data should be managed securely, as described in “Appendix 0: Quality management system to be constructed at the Verification Organizations, 3 Quality management system, (3) Control of documents and records.” A Verification Organization shall appoint a data quality manager.

(2) Data analysis and presentation

The data obtained in the verification test should be analyzed statistically and presented. All mathematical expressions used for statistical analysis shall be given in the Verification Report. The data not subjected to the statistical analysis (including that obtained under disrupted conditions) shall be reported in the Verification Report.

i Analysis and presentation of verification items regarding waste gas treatment performance

- Graph illustrating changes in the concentrations of dichloromethane, etc. in the inlet and outlet ducts of the target verification apparatus
- Graph illustrating changes in temperature and flow rates in the inlet and outlet ducts of the target verification apparatus
- Humidity in the inlet duct of the target verification apparatus
- Amounts of dichloromethane or another solvent dispensed and recovered and recovery rate (mass balance)

ii Analysis and presentation of verification items regarding environmental load

- Measurements of measurement items
- Other findings

iii Analysis and presentation of verification items regarding O&M

- Measurements of resource consumptions
- Remarks on the number of operators and the level of operator skill required for O&M of the target verification apparatus
- Findings on installation site constraints
- Findings on measures in the event of power failure or other problems
- Findings on measures in the event of ignition or other risks
- Findings on consistency of treatment performance and necessity for recovery of chemicals
- Findings on evaluation of O&M manual
- Other findings

3. Environment, health and safety

The Verification Organization should take strict environment, health and safety measures with respect to the verification test. In establishing a Test Plan, relevant environmental problems and potential hazards regarding the verification test and Test Site should be identified, and countermeasures against them should be specified. The Verification Organization should inform the personnel at the Test Site, including employers and employees who are not involved in the verification test, of the potential hazards and the countermeasures against them. The following, among others, are to be discussed in establishing a Test Plan:

- Precaution regarding the operation of the target verification apparatus, emission of processed wastewater, and generation of secondary products
- Biological, chemical and electrical hazards
- Handling, storage and discharge of the chemicals relevant to the verification test
- Handling and discharge of residues and waste relevant to the verification test
- Material Safety Data Sheet
- Compliance with local regulations regarding electricity and plumbing
- Exhaust and ventilation systems, when gases are generated in the target verification apparatus
- Prevention of fires
- Confirmation of emergency contacts (emergency medical, fire fighting, etc.)
- Ensuring of occupational health and safety
- Others

The address and phone number of emergency contacts, and of the nearest hospital should be listed on one page. The sheet should be displayed in a suitable location, protected with a transparent plastic cover.

Appendix 0: Quality management system to be constructed at the Verification Organizations

Introduction

The Verification Organizations participating in the pilot project for the environmental technology verification should desirably construct the quality management system in accordance with JIS Q 17025:2000 (ISO/IEC 17025:1999) “General requirements for the competence of testing and calibration laboratories.” In this Appendix, some elements of the quality management system that are required to be constructed at Verification Organizations that do not have such a quality management system in accordance with the above standard will be described.

1. Scope

The quality management system specified in this Appendix is applicable to all departments or procedures relevant to the verification test in the Verification Organization. In addition, if part of the verification test is subcontracted to an external organization, that organization is also included in the scope of application.

The Verification Organization in which all departments relevant to the verification test have already received the following certification, JIS Q 17025:2000 (General requirements for the competence of testing and calibration laboratories) or JIS Q 9001:2000 (Quality management systems - Requirements), will be regarded as satisfying the requirements specified in this Appendix.

2. References

JIS Q 17025:2000 (ISO/IEC 17025:1999) General requirements for the competence of testing and calibration laboratories

JIS Q 9001:2000 (IS0 9001: 2000) Quality management systems – Requirements

3. Quality management system

(1) Organization and responsibility

The organization concerned shall be an entity that can be held legally responsible.

The responsibilities of key personnel in the organization relevant to the verification tests shall be clearly defined.

Appoint a member of the staff as a quality manager (however named) who, irrespective of his or her other duties and responsibilities, shall have defined responsibility and authority for ensuring that the quality system is implemented and followed at all times.

(2) Quality system

The organization concerned shall establish, implement, and maintain a quality management system appropriate to the scope of its activities regarding the verification test.

In the quality management system, the quality policy regarding the verification test and the procedures for the quality management system shall be documented. These documents shall be communicated to and understood by the appropriate personnel.

The policy shall include the following:

a) The organization’s commitment to ensuring the quality of verification tests

b) The organization’s statement on the quality standard of the verification tests

c) The objectives of the quality system

d) A description of the construction and implementation of the quality management system

In addition, the system for promoting verification tests, as well as the role, responsibility, and authority of the personnel concerned, shall be documented.

(3) Control of documents and records

The organization concerned shall control documents such as the standards regarding the verification tests (protocol for the verification and relevant standards) and the Test Plan, as well as drawings, software, specifications, written directives, and manuals.

With respect to document control, the following shall be ensured:

a) All documents shall be reviewed and approved for use by authorized personnel prior to their issuance.

b) All documents shall contain a description of the relevant documents to ensure that appropriate documents can be found easily and are available at any time at all Test Sites.

c) Invalid and/or obsolete documents shall be promptly removed or be assuredly prevented from unintended use.

d) The management method for documents as data shall be specified and maintained.

e) The form for records and the location of documents, as well as the inspection method, shall be specified and maintained.

In addition, records regarding the verification tests shall be identified, properly collected, indexed, specified for usage, filed for applications, maintained, and adequately discharged, and the storage period for them shall be decided. In particular, records in the original copy of the test data, data and information that enable trace audits, records of calibrations, records of the persons involved, each individual report published, and copies of calibration certificates shall be stored for a predetermined period.

(4) Subcontracting of the tests

If the organization concerned subcontracts to perform the verification test, the organization shall select a competent external organization, and demand the same quality management as that of the Verification Organization.

(5) Purchase of goods and services

The organization concerned shall examine, by appropriate measures such as inspection, whether the goods and services purchased from external sources that may affect the quality of verification tests satisfy the requirements specified in the protocol for the verification, and shall not use them for the verification tests until this examination is completed.

In addition, the organization shall evaluate the suppliers of goods and services, and make a list of the approved suppliers.

(6) Control of complaints and nonconforming tests

The organization concerned shall have a system and method that shall be implemented when any of its verification tests or the results of these tests do not conform to the protocol for the verification or other specifications for any reason. The organization shall have a system and method for handling contingencies such as complaints from environmental technology developers, the inhibition of impartiality, information leaks, and others. These systems shall include the person in charge and personnel required for the handling of such cases.

(7) Corrective and preventive actions

When any of its verification tests or the results of these tests do not or may not conform to the protocol for the verification or other specifications, the organization concerned shall investigate the reasons and take corrective or preventive actions.

(8) Audit

The organization concerned shall conduct audits to judge whether the verification test has been properly conducted. When the verification test is subcontracted to an external organization, the operations of the subcontracted organization shall be audited.

The audit shall be conducted at least once during the test period. If the verification test lasts for 2 years or more, the audit shall be conducted periodically, and the frequency of the audit shall desirably be more than once per year.

In addition, the audit shall be conducted by personnel who are independent of the verification test to as great an extent as possible. The results of the audit shall be reported to the superintendent of the organization concerned.

4. Technical requirements

(1) Personnel

The organization concerned shall ensure the competence of all who operate specific equipment for the verification test, perform tests, evaluate results, and sign test reports. The personnel performing specific tasks shall be qualified on the basis of appropriate education, training, and/or demonstrated skills, as required.

(2) Accommodation and environmental conditions

The facilities for the verification test, including but not limited to energy sources, lighting, and environmental conditions, shall be such as to facilitate correct performance of the tests. The organization concerned shall ensure that the environmental conditions do not invalidate the results or adversely affect the required quality of any measurement. Particular care shall be taken when the verification test is undertaken at sites other than a permanent laboratory facility.

The organization concerned shall monitor, control, and record environmental conditions of the test in accordance with the protocol for the verification, the Test Plan, and other standards. Tests shall be stopped when the environmental conditions jeopardize the results of the tests.

(3) Test methods and method validation

The organization concerned shall use appropriate methods and procedures for all tests within its scope and determine the test methods in accordance with the protocol for the verification.

When the method to be used is not specified in the protocol for the verification, the organization concerned shall select either an appropriate method disclosed in international standards, regional or national standards, scientific texts, or the like, or a method specified by the manufacturer of the equipment. When it is necessary to use methods not covered by standard methods, these shall be subject to agreement with the verification applicant, and their validity shall be appropriately examined prior to use. Validation is the confirmation by examination that the requirements for a specific intended use are fulfilled. The validation shall be conducted based on discussion and subsequent approval by the Technology Panel.

When computers or automated equipment are used for data management, the organization concerned shall provide suitable environmental and operational conditions for the purpose of managing the computers and automated equipment properly, to ensure that there is no loss or improper conversion of data as a result of accidental erasure.

(4) Equipment

The organization concerned shall be furnished with (or leased) all items of the equipment required for the execution of verification tests. If a piece of equipment can only be operated by authorized personnel, the organization concerned shall specify the equipment. Equipment that has been subjected to overloading or mishandling, gives suspect results, or has been shown to be defective or outside specified limits, shall be taken out of service until it has been repaired and confirmed to perform correctly.

(5) Measurement traceability

All equipment used for tests that has a significant effect on the accuracy or validity of the result of the verification test shall be calibrated before being put into service.

(6) Sampling

The organization concerned shall take samples of reagents, materials, or products in accordance with the protocol for the verification.

(7) Handling of test and calibration items

If necessary, the organization concerned shall transport, receive, handle, protect, store, retain, and/or dispose of test items in accordance with the protocol for the verification.

(8) Verification of data and assurance of test result quality

The data resulting from the verification test shall be recorded in such a way that trends are detectable and, where practicable, statistical techniques shall be applied to the review of the results. This verification shall be conducted by a person other than the one who conducts the verification test.

(9) Reporting the results

The organization concerned shall report the results of the test conducted accurately, clearly, unambiguously, and objectively in accordance with the protocol of the verification tests.

Appendix 1: Application form for verification

A verification applicant should submit the application form specified below.

If apparatuses of the same series that handle different types of solvent or are different in size are available, the target apparatus shall be described.

【Applicant】

Company name*	
Address*	
Division and name of person in charge*	
Contact address*	TEL: FAX:
	e-mail:
Name of technology/product*	

1. Overview of the technology

Configuration and process flow diagram (If local ventilation equipment is combined, include the equipment in the diagram.)
Principle
Purpose and specifications of this technology Combined with ventilation equipment: Supported types of solvent: (Solvent that should be used in a verification test:) Supported range of concentrations of solvent Necessity for adjustment of recovered solvent components: Target performance (concentration in the outlet, recovery rate, etc.):
Features / selling points (Also give a description of a design feature or device for sucking in solvent gas.)

2. In-house test results

【Test method】

Method of determining concentration	

【Test conditions】

Treatment time	Min batch(es)
Solvent to be handled	
Product to be degreased*	
Degreasing equipment to be used*	Serial number
Opening area of degreasing equipment to be used*	㎡ (m × m)

* These items need not be filled in for a test using a simulator.

【Test results】

	Inlet of the target verification apparatus	Outlet of the target verification apparatus
Temperature	℃	℃
Humidity	%	%
Flow rate		㎥／min
Solvent concentration	PPM	PPM

【Performance evaluation】

Recovery rate	% * Circle either of the following: 1.Use a simulator (Gas trapping rates due to food work are not taken into consideration.) 2. Use actual degreasing equipment

* If continuously measured data on the concentrations of dichloromethane, etc. are available, attach the relevant data.

3. Product data (Submit a technical specification as an attached document.)

Items		Description
Name of the target verification apparatus		
Serial number		
Name of manufacturer (distributing agent)		
Contact address	TEL	( ) –
	FAX	( ) –
	Website	http://
	E-mail	@
Dimensions	W(mm)	
	D(mm)	
	H(mm)	
Weight (kg)		
Capacity of the sterilizer used (L)		
Restriction on Installation site	Particular specifications of compatible degreasing instruments	
	Specific conditions for installations on rooftops, such as weight load	
Necessity of pre- and post-treatment		Not necessary - Necessary Specify the treatment in detail: (・Treatment of wastewater: ・Treatment of secondary products: ・Treatment of waste solvent and other waste products: ・Others:)
Additional equipment		Not available - Available Specify the equipment in detail: ( )
Life of the target verification apparatus		

Items	Description			
	Expense item	Unit cost	Quantity	Total
Approximate cost	Initial cost			
Examples of expense items of the initial cost: Installation cost, construction cost, etc.	Total			
	Running cost (per day (24 hours))			
Examples of expense items of the running cost: Consumables, disposal of secondary products, electricity, etc.				
	Total			

4. Developmental status and past delivery record

Check the number that best describes the current situation.
1. The apparatus is only available as a pilot unit and is not commercialized.
2. The apparatus has already been commercialized and is available as a product.
3. The apparatus has past delivery records.
4. Apparatuses of the same series (principle) that handle different types of solvent or are different in size have been delivered.

↓

Specify the past records in detail:

( )

5. Product series

If apparatuses of the same series that handle different types of solvent or are different in size are available, outline them and describe special differences in specifications.

6. Other relevant or unique features (if any)

[Documents to be attached to this application form]

○ Basic technical specification for the target verification apparatus

○ Results of in-house performance tests (Attach not only data on the performance of treating

organochlorine degreasing agents such as dichloromethane, but also data on installation site constraints, measures in the event of a power failure or other problems, consistency of treatment performance, or continuous measurement data obtained from a recovery test of organochlorine degreasing agents such as dichloromethane, if available.)

○ O&M manual

An O&M manual is a document that describes methods for operating and maintaining a target verification apparatus. An O&M manual shall contain the following information:

- Method for installing the target verification apparatus
- Method for operating the target verification apparatus (standard operational pattern, required treatment time, etc.)
- Method for maintenance and management
- Troubleshooting

Appendix 2: Test Plan

The Test Plan provides a general description of the objectives and procedures of verification tests, such as the design of verification tests and the various procedures in the verification tests. The content of the Test Plan may vary according to circumstances, but should include at least the following:

1. Cover sheet/approval of the verification test participants/table of contents

A cover sheet for the Test Plan, names of pilot project participants (responsible official of the Verification Organization and the environmental technology developer) who approved the Test Plan, and the table of contents shall be given.

2. Participating organizations and personnel responsibilities

The organizations participating in the verification tests and the responsibilities of the representatives shall be described.

3. The target verification technology and apparatus description

- Principle of the target verification apparatus, system configuration including pre- and post-processing
- Dimensions and weight of the target verification apparatus
- Required consumables, expendables, electricity and other resource consumptions
- Work items required for the O&M of the target verification apparatus
- Wastewater discharged from the target verification apparatus
- Secondary products discharged from the target verification apparatus, their physical and chemical properties, ratios of those secondary products to the amount of organochlorine degreasing agents such as dichloromethane handled
- Waste solvent and other waste products discharged from the target verification apparatus
- The level of operator skill required to successfully operate the target verification apparatus
- Noise and foul odor control, housing requirement

4. Contents of the verification test

(1) Test period

- Test period and schedule

(2) Verification test for the verification items regarding waste gas treatment performance

- Verification items regarding waste gas treatment performance
- Data measurement methods and equipment
- Analytical methods and instruments, analytical schedule
- Calibration methods and calibration schedule

(3) Verification test for the verification items regarding environmental load

- Verification items regarding environmental load
- Analytical methods and instruments, analytical schedule

(4) Verification tests for the verification items regarding operations and maintenance

- Verification items regarding operations and maintenance
- Operational schedule, person in charge, and documentation formats

- Methods of evaluating the data provided by the environmental technology developer
- Other verification items, evaluation methods, and information collection schedule

5. Quality control of data

- Methods of documenting measurement procedures
- Information on accuracy control
- Necessity for supplying additional quality management information (All unprocessed data shall be stored as the Appendix of the Verification Report.)

6. Management, analysis and presentation of data

(1) Data management

Data that are produced in the verification test and are to be managed and forms in which the data should be managed shall be specified.

(2) Analysis and presentation

Methods of data analysis and presentation format of data shall be specified in the Test Plan.

7. Audit

An audit schedule, audit procedures, and information on the audit group shall be specified in the Test Plan.

8. Appendix

The following should be described in the Test Plan as an Appendix:

- O&M manual provided by the environmental technology developer
- Other literature and data for reference

Appendix 3: Form of Verification Report

Target verification technology / environmental technology developer	
Verification Organization	
Verification test period	
Purpose of this technology	

Intended mainly to verify the performance of treating solvent gas fed into a waste gas treatment system, this test does not take into consideration solvent gas discharged directly into the atmosphere without being sucked into the system or discharged from local ventilation equipment used in combination with the system.
This verification test uses gas artificially generated from solvent, and the effects of evaporation of solvent induced by excessive air volume, mixing of grease from metal, and other factors assumed under actual use conditions cannot be evaluated.
Consideration must be given to these points in selecting an apparatus.

1. Overview of the target verification technology (If local ventilation equipment is combined, also describe the equipment.)

	Method	Principle

2. Overview of the verification test

○ Specifications of the target verification apparatus

Item	Specifications and capacity
Type	
Dimensions and weight	W mm×D mm×H mm kg
Solvent type to be used and components	

○ Settings for verification test conditions

	Solvent to be used	Air volume of the target verification apparatus
Setting value		m^3/min

	Total amount of dispensed solvent	
	Pattern A	Pattern B
Setting value	g	g

	Test room	
	Temperature	Humidity
Setting value	℃	% (at the temperature given on the left)

3.Results of the verification test

○ Verification items regarding waste gas treatment performance

◆Pattern A

【Evaluation results of waste gas treatment performance】

Item		Inlet	Outlet
Temperature		℃	℃
Relative humidity		%	%
Flow rate		㎥／min	㎥／min
Concentrations in waste gas	Maximum value	ppm	ppm
	Minimum value	ppm	ppm
	Mean value	ppm	ppm

Item	Evaluation of performance
Amount of recovered solvent	g
Recovery rate	%

【Changes in concentration】

◆Pattern B

【Evaluation results of waste gas treatment performance】

Item		Inlet	Outlet
Temperature		℃	℃
Relative humidity		%	%
Flow rate		㎥／min	㎥／min
Concentrations in waste gas	Maximum value	ppm	ppm
	Minimum value	ppm	ppm
	Mean value	ppm	ppm

Item	Evaluation of performance
Amount of recovered solvent	g
Recovery rate	%

【Changes in concentration】

◆Properties and components of recovered solvent (reference)

○ Verification items regarding environmental load

Item	Results
Production of wastewater	
Production of secondary products	
Production of waste products	
Noise (reference value)	
Others	(If concentrations at the outlet were determined when the equipment was not in operation, give them in this field.)

○ Verification items regarding O&M

Item		Waste gas treatment test using a simulator	
		Pattern A	Pattern B
Electricity consumption	When equipment is in operation	kWh/operation (min)	kWh/operation (min)
	When equipment is not in operation	kWh/operation	kWh/operation
Fuel consumption	When equipment is in operation		
	When equipment is not in operation		
Water consumption	When equipment is in operation		
	When equipment is not in operation		
Other chemical consumption such as reactant	When equipment is in operation		
	When equipment is not in operation		

Qualitative findings

Item	Findings
Number of operators and the level of operator expertise required for O&M of the apparatus	
Evaluation of O&M manual	
Others	

(Reference information)

All information in this page is provided by the environmental technology developer in an application for a verification test at its own responsibility. The Ministry of the Environment and the Verification Organization assume no responsibility for the information.

○ Product data

Item		Description (to be filled in by the environmental technology developer)
Name / type		
Name of manufacturer (distributing agent)		
Contact address	TEL/FAX	( ) － ／( ) －
	Website	http://
	E-mail	@
Dimensions / weight		× × (mm) kg
Necessity of pre- and post-treatment		(Recovery of chemicals, etc.)
Additional equipment		(Local ventilation, etc.)
Degreasing equipment to which equipment under test can be attached and other special remarks Supported types of solvent		
Consistency of treatment performance		(If a single apparatus can handle two or more types of solvent with no design change, describe how that can be achieved.)
Method of restoring from a power failure or other problems		
Life of the target verification apparatus		
Approximate cost (Japanese yen) (Use power, fuel, and water consumptions determined by the Verification Organization to estimate costs. The running costs for pattern A and B shall be averaged to estimate the final running cost. Also include costs required in post-processing.)	Initial cost	
		×
		×
		×
	Total	
	Running cost per day (24 hours)	
	Total	

○ Other information provided by the manufacturer

Design feature or device for sucking in solvent gas from degreasing equipment
If apparatuses of the same series that handle different types of solvent or are different in size are available, outline them and describe special differences in specifications.
Others

Reference

Ⅰ.Brief overview of the pilot project for the environmental technology verification

1. Objectives

Many innovative environmental technologies that are already at a practically applicable stage and seem to be useful have not come into wide use because end users, including local municipal entities, companies, consumers, and the like, cannot use the technologies with confidence due to the lack of objective evaluation of the environmental protective effect and the like.

Accordingly, in this pilot project for the environmental technology verification, with respect to the innovative environmental technologies that have not been widely accepted as described above, the environment protective effect and others will be objectively verified by an independent organization on an experimental basis.

It is hoped that the pilot project for the environmental technology verification will accelerate the dissemination of the environmental technologies developed by venture companies and the like, and contribute to the activation of economic activity through environmental protection and the advancement of regional environmental industries.

2. What the “verification” means

In the pilot project for the environmental technology verification, the environmental protective effect and the like of particular environmental technologies will be verified through the collection of objective data based on various tests and others. There is a similar term, “certification,” in which the suitability to the standard of an environmental technology is judged in terms of the performance that a technology should provide. The present project does not conduct such “certification.”

3. System for promoting the project

The pilot project for the environmental technology verification will be conducted by the Ministry of the Environment in cooperation with the “Verification Organizations” (local municipal entities, etc.), which are independent organizations that conduct technology verification under the entrustment and contract of the Ministry of the Environment.

4. Procedures of the project

The pilot project for the environmental technology verification will generally be conducted in accordance with the following procedures:

(1) The Ministry of the Environment will identify the needs of the technology developers / distributing agents, users, and others, through the use of questionnaires or the like.

(2) The Ministry of the Environment will select target verification technology fields based on discussions in the committee on the pilot project for the environmental technology verification.

(3) The Ministry of the Environment will prepare a “protocol for the verification,” which establishes the specific methods of technology verification regarding the selected target verification technology fields.

(4) The Ministry of the Environment will select the “Verification Organizations,” which are the independent organizations that conduct the verification tests.

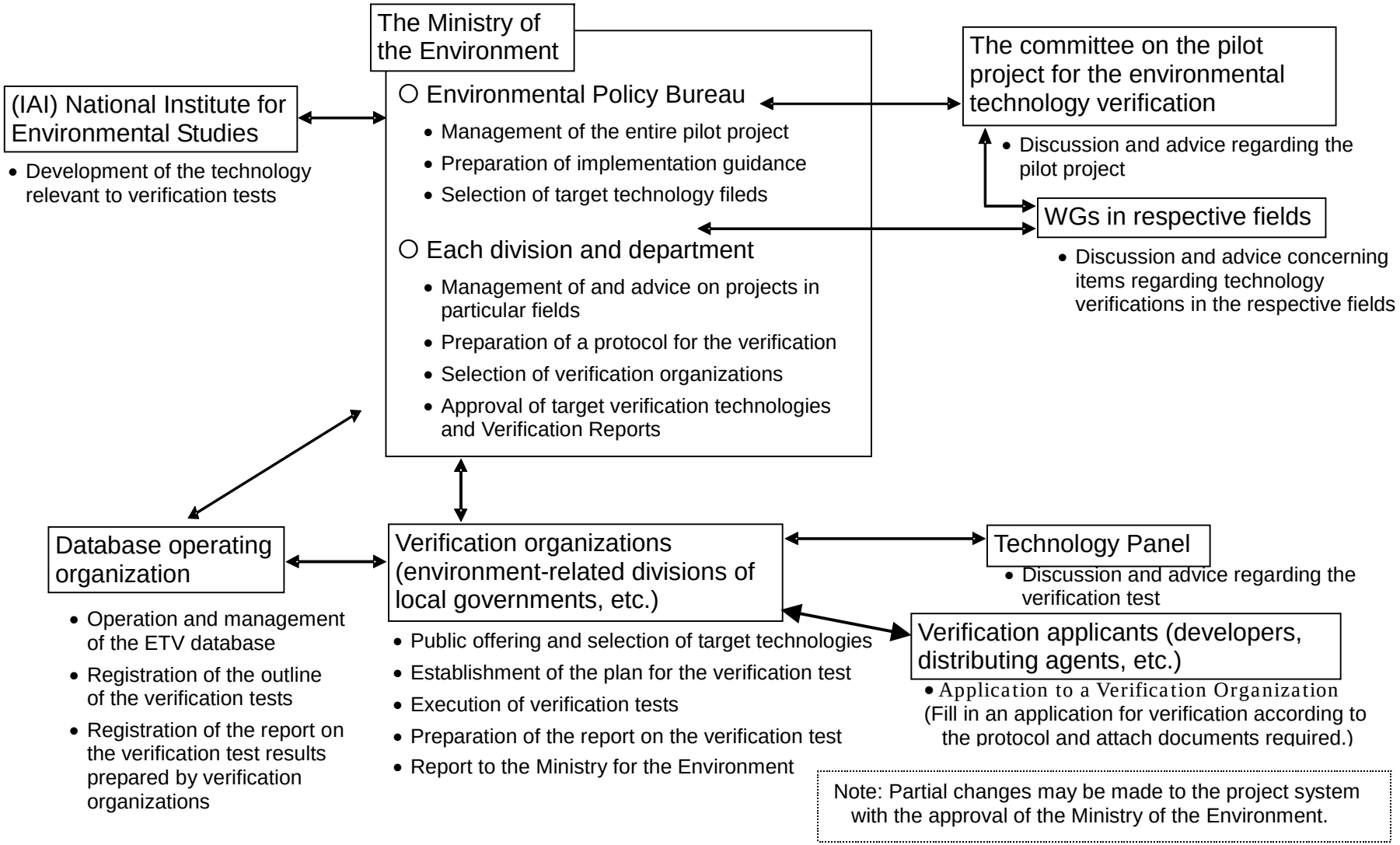
(5) The Verification Organizations will invite applications from companies and the like for the technology to be verified.

(6) The Verification Organization will select the technologies to be verified in the project from among the applications, following discussion in a panel consisting of the specialists.

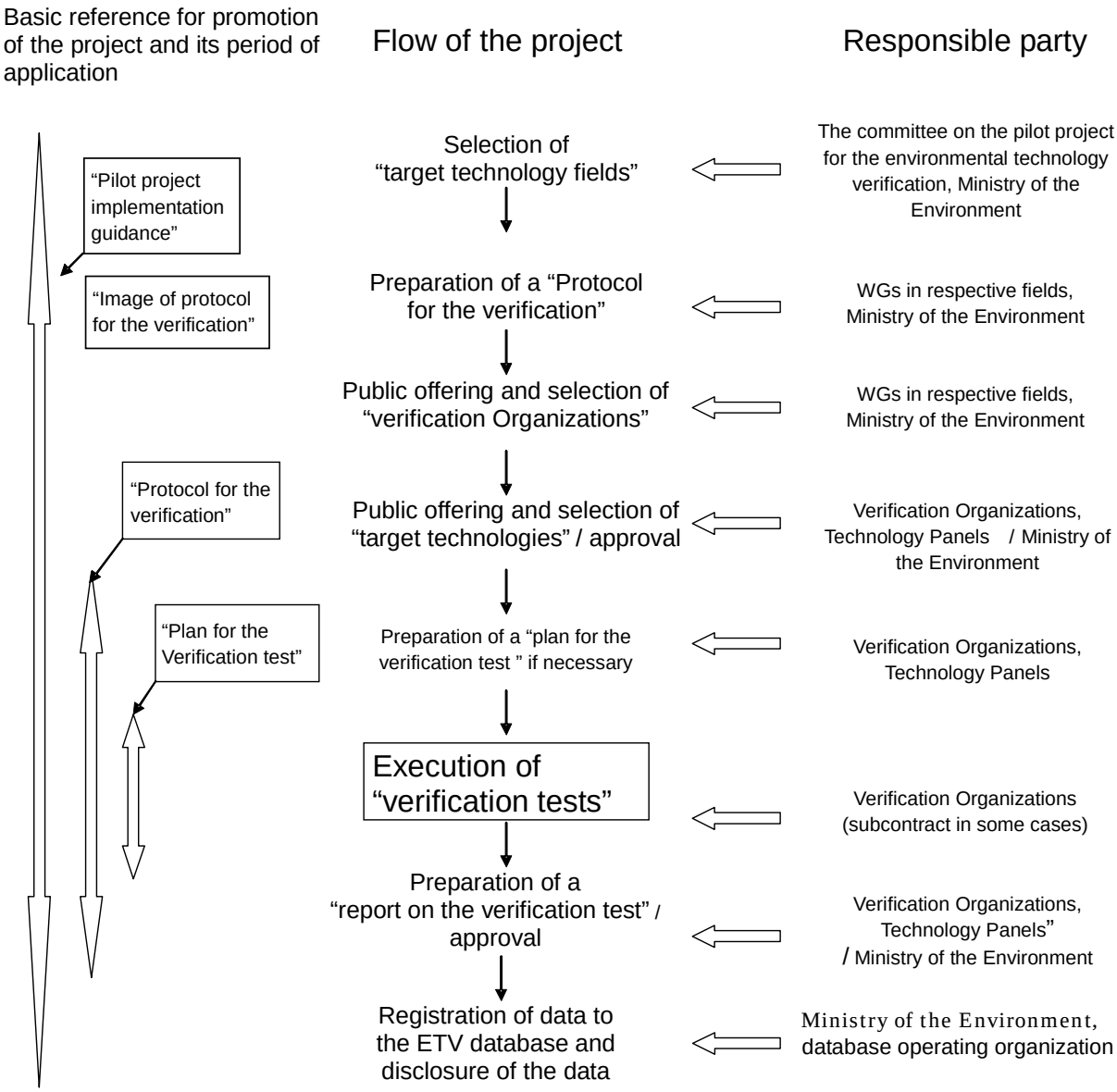
(7) The Verification Organizations will conduct verification tests on the selected technologies in accordance with the protocol for the verification.

(8) The Verification Organizations will summarize the results of the test in report form, notify the technology developers/distributing agents of them, and report to the Ministry of the Environment. In addition, the report will be registered in a database on the Internet and made available to the public

II. System for promotion of the “pilot project for the environmental technology verification”



III. Flow of the pilot project for the environmental technology verification



IV. Prospectus for organizing the working group on the VOC treatment technology in the committee on the pilot project for the environmental technology verification for 2004

1. Objective of the working group

The working group on the VOC treatment technology is established for the purpose of discussing based on specialized knowledge of "ethylene oxide treatment technology" and "VOC treatment technology (Treatment technologies for organochlorine degreasing agents such as dichloromethane)," the technology fields in which technology verification is scheduled to be conducted in 2004, in the pilot project for the environmental technology verification and thus promoting the project smoothly and efficiently.

2. Items to be investigated and discussed

(1) Field of ethylene oxide treatment technology

(i) Preparation of a protocol for the verification

(ii) Selection of Verification Organizations

(iii) Confirmation of Verification Reports

(iv) Other items relevant to execution of the project

(2) Field of VOC treatment technology (Treatment technologies for organochlorine degreasing agents such as dichloromethane)

(i) Preparation of a protocol for the verification

(ii) Selection of Verification Organizations

(iii) Confirmation of Verification Reports

(iv) Other items relevant to execution of the project

(3) How future verification tests shall be conducted, and the selection of candidate technology fields

3. Organization and others

(1) The working group consists of 10 or fewer members.

(2) The working group has a chairperson.

(3) The chairperson will supervise the working group.

(4) The members will be appointed by UFJ Institute Ltd., from among academic experts, well-informed individuals, and the like relevant to verification tests on VOC treatment technology, with the approval of the Environmental Management Bureau of the Ministry of the Environment.

(5) The members will be under commission for the period from the date of appointment by the UFJ Institute Ltd. to the end of the same fiscal year.

(6) In addition, participants and interested parties in the pilot project for the environmental technology verification may also attend the meetings of the working group as observers and the like, if necessary.

4. Disclosure of the discussion and others, etc.

Meetings of the working group will, in principle, be held in public. However, the chairperson may hold a closed meeting of the working group if a public meeting may cause significant obstacles to fair and neutral discussion, and provide particular individuals with unfair benefit or detriment.

5. Secretariat

The general affairs of the working group will be processed by UFJ Institute Ltd., with the consent of the Environmental Management Bureau of the Ministry of the Environment.

The committee on the pilot project for the environmental technology verification for 2004

List of the members of the working group on the VOC treatment technology

Yoshiharu Iwasaki	Chief Director, Tokyo Metropolitan Research Institute for Environmental Protection
Akira Obuchi	Group Leader, Catalytic and Electrochemical Purification Group, Institute for Environmental Management Technology, National Institute of Advanced Industrial Science and Technology
Seitaro Kato	Lecturer, Faculty of Science and Engineering, Chuo University
Kazuhiko Sakamoto	Professor, Graduate School of Science and Engineering, Saitama University
Kosaku Shiga	Director, Institute of Environmental Science, Tokyo Electroplating Industrial Association
Junichi Doi	Director, Japan Industrial Conference on Cleaning
Osami Nakasugi	Affiliate Professor, Office of Industry and Community Liaison, Yokohama National University
Yohei Yamakawa	Director, Administrative Department, Musashino Red Cross Hospital (former director of Pharmaceutical Affairs, Bureau of Public Health, Tokyo Metropolitan Government)

< Secretariat (Ministry of the Environment) >

Izumi Tokunaga	Director, Environmental Control Technology Office, Environmental Management Bureau
Masataka Segawa	Deputy Director, as above
Hiroko Tanaka	Chief of planning section, as above
Naoki Arai	Chief of Motor Vehicle Noise Section, as above
Kazumi Yoshikawa	Deputy Director, Air Quality Management Division, Environment Management Bureau
Toshihiro Azuma	Deputy Director, Environment Health and Safety Division, Environment Health Department
Kenji Ueda	Deputy Director, Office of Environmental Research and Technology, Environmental Policy Bureau

< Secretariat (UFJ Institute Ltd.) >

Eiko Saito	Senior Analyst, Environmental Policy Consulting Department
Ogi Kanaya	Analyst, Environmental Policy Consulting Department
Takashi Morimoto	Analyst, Environmental Policy Consulting Department
Kotaro Shimizu	Analyst, Environmental Policy Consulting Department

V. Particulars discussed in the working group on the VOC treatment technology

First meeting: 15:30 to 18:00. May 19, 2004

- Review of reports of verification tests on ethylene oxide treatment technologies conducted in 2003
- Review of the protocol for the verification tests on ethylene oxide treatment technology (second edition)
- Public offering and selection of Verification Organizations of ethylene oxide treatment technologies

Second meeting: 13:00 to 15:00. June 30. 2004

- Hearing from applicants for Verification Organizations of ethylene oxide treatment technologies
- Selection of Verification Organizations of ethylene oxide treatment technologies
- Protocol for the verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane

Third meeting: 15:00 to 17:00. August 3, 2004

- Protocol for the verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane (first draft)

August 18, 2004 to September 1, 2004

- Invite public opinion on the protocol for the verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane (second draft)

Fourth meeting: 13:00 to 15:00. September 22, 2004

- Protocol for the verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane (third draft)
- Public offering and selection of Verification Organizations of treatment technologies for organochlorine degreasing agents such as dichloromethane

[Reference] Particulars discussed in the working group on the ethylene oxide treatment technology in 2003

First meeting: 10:00 to 12:00. July 15, 2003

- ○ Ethylene oxide treatment technology
- ○ Protocol for the verification tests on ethylene oxide treatment technology (draft)

Second meeting: 9:00 to 12:00. August 5, 2003

- ○ Opinions on the protocol for the verification tests on ethylene oxide treatment technology (draft)
- ○ Protocol for the verification tests on ethylene oxide treatment technology (draft)

Third meeting: 10:00 to 12:00. September 2, 2003

- ○ Protocol for the verification tests on ethylene oxide treatment technology (second draft)
- ○ Public offering and selection of Verification Organizations of ethylene oxide treatment technologies

Fourth meeting: 10:00 to 12:00. October 10, 2003

- ○ Hearing from applicants for Verification Organizations of ethylene oxide treatment technologies
- ○ Selection of Verification Organizations of ethylene oxide treatment technologies

Fifth meeting: 13:30 to 16:00. March 23, 2004

- ○ Summary of reports of verification tests on ethylene oxide treatment technologies (draft)