

Third Edition

Pilot project for the environmental technology verification  
In the field of VOC treatment technology  
(Dichloromethane and other organochlorine degreasing agents treatment technology)

# Protocol for the verification tests on dichloromethane and other organochlorine degreasing agents treatment technology

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Environmental Management Bureau,  
Ministry of the Environment

# Table of Contents

<b>Main section</b> .....	<b>1</b>
<b>I. Introduction</b> .....	<b>1</b>
1. Target technologies.....	1
2. Types and outline for verification tests .....	2
(1) <i>Types of verification tests</i> .....	2
(2) <i>Outline of verification testing process</i> .....	2
3. Definitions of terms and phrases .....	3
<b>II. Verification test system</b> .....	<b>5</b>
1. Ministry of the Environment .....	5
2. The committee on the pilot project for the environmental technology verification	5
3. Verification Management Organization .....	5
4. Working group on the VOC treatment technology .....	5
5. Verification Organizations .....	5
6. Technology Panels .....	6
7. Environmental Technology Developers .....	6
<b>III. Selection of target verification technologies</b> .....	<b>7</b>
1. Application .....	7
2. Selection of target verification technologies.....	7
<b>IV. Preparation for the verification tests</b> .....	<b>8</b>
1. Determination of verification items.....	8
(1) <i>Verification items regarding waste gas treatment performance</i> .....	8
(2) <i>Verification items regarding environmental load</i> .....	9
(3) <i>Verification items regarding operations and maintenance</i> .....	10
2. Establishment of the Test Plan.....	12
<b>V. Verification test methods</b> .....	<b>13</b>
1. Operations and maintenance.....	13
(1) <i>Regular operations and maintenance</i> .....	13
(2) <i>Actions in the event of disruption in conditions</i> .....	13
(3) <i>Cost estimation</i> .....	13
2. Test conditions .....	13
(1) <i>Setting for test conditions</i> .....	13
(2) <i>Test conditions to be recorded</i> .....	16
3. Measurement methods.....	17
(1) <i>Measurement methods for verification items regarding waste gas treatment performance</i> .....	17
(2) <i>Measurement methods for the verification items regarding environmental load</i> ...	18
(3) <i>Measurement methods for the verification items regarding operations and maintenance</i> .....	19
4. Management of analytical accuracy .....	21
<b>VI. Preparation of the Verification Report</b> .....	<b>22</b>

<b>VII. Remarks in conducting the verification test .....</b>	<b>23</b>
1. Quality control of data.....	23
(1) <i>The method for quality control of data.....</i>	<i>23</i>
(2) <i>Measurement and data acquisition.....</i>	<i>23</i>
2. Management, analysis, and presentation of data.....	23
(1) <i>Data management.....</i>	<i>23</i>
(2) <i>Data analysis and presentation .....</i>	<i>23</i>
3. Environment, health and safety .....	24
4. Fees .....	24
(1) <i>Setting up and collecting fees.....</i>	<i>24</i>
5. Change and cancellation of verification tests.....	26
(1) <i>Addition of verification items by request of the environmental technology developer.....</i>	<i>26</i>
(2) <i>Cancellation (declining) of test by request of the environmental technology developer.....</i>	<i>26</i>
(3) <i>Addition of test items by judgment of the Verification organization.....</i>	<i>26</i>
 <b>Appendix 0: Quality management system to be constructed at the Verification Organizations .....</b>	<b>28</b>
<b>Appendix 1: Application form for verification .....</b>	<b>32</b>
<b>Appendix 2: Test Plan .....</b>	<b>37</b>
<b>Appendix 3: Form of Verification Report (Provisional version) .....</b>	<b>39</b>
<b>Appendix 4: Reference regarding the setting of relative vapor pressure (FY2005) .....</b>	<b>44</b>
 <b>Reference .....</b>	<b>i</b>
I. Brief overview of the pilot project for the environmental technology verification.....	i
II. System for promotion of the “pilot project for the environmental technology verification” .....	iii
III. Flow of the pilot project for the environmental technology verification.....	iv
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 2005 .....	v
V. Particulars discussed in the working group on the VOC treatment technology .....	ix

# Main section

## I. Introduction

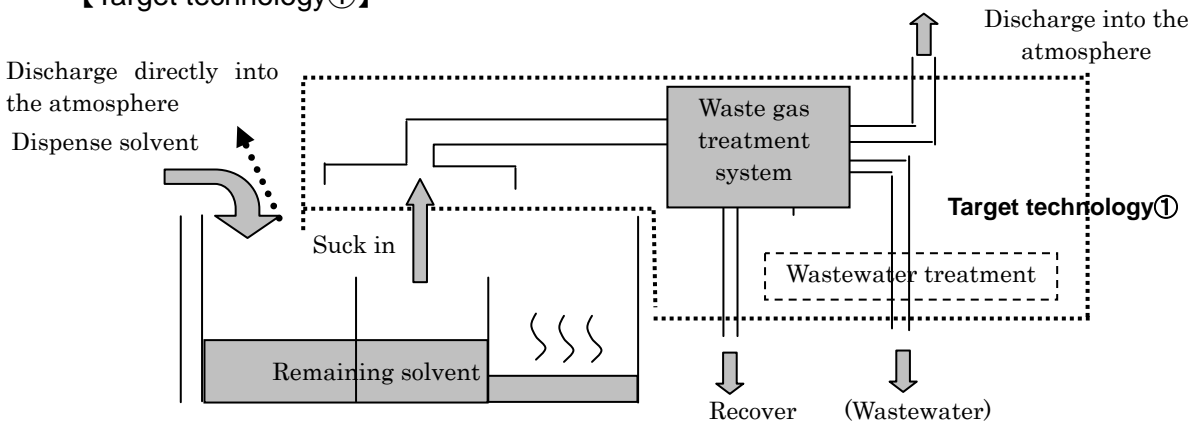
### 1. Target technologies

VOC treatment technologies (dichloromethane and other organochlorine degreasing agents treatment technologies) covered by this pilot project are those (equipment, etc.) that can be installed later to properly treat waste gas from dichloromethane or other organochlorine degreasing agents, 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. Among these technologies, this protocol for the verification specifically covers technologies that are low in cost, small in scale, easy to maintain, commercially available, and intended for small- and medium-sized plating businesses (hereinafter referred to as dichloromethane, etc. treatment technologies).

Incineration is another possible technology for treating dichloromethane, etc. but the pilot project focuses on technologies for recovering dichloromethane, etc. until they become widely available 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**

**【Target technology①】**



**【Target technology②】**

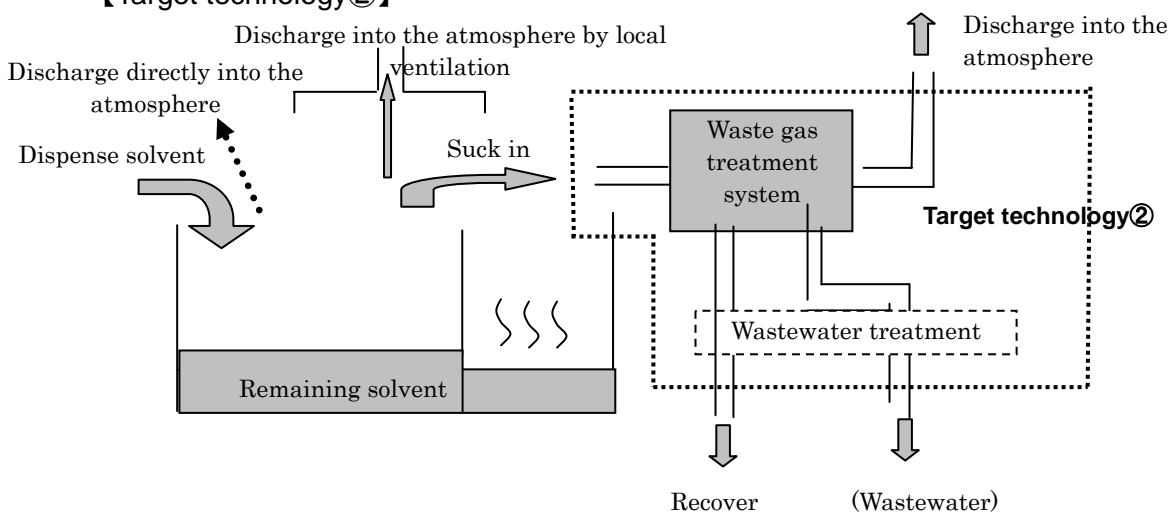


Figure 1 shows images of the target technologies. This protocol targets two technologies: solvent recovery equipment installed in place of local ventilation equipment, which is now commonly used (target technology (1)) and solvent recovery equipment used in combination with local ventilation equipment (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 to the Ministry of the Environment, which will give an approval based on the results of the examination as to whether the verification has been conducted in a suitable manner. The examination is carried out by the working group on the VOC treatment technology of the committee on the pilot project for the environmental technology verification (hereinafter referred to as “working group”). 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**

<b>Term/Phrase</b>	<b>Definition</b>
Target verification technology	Method for treating dichloromethane and other organochlorine degreasing agents 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
- Establish and administer the committee of the pilot project for the environmental technology verification
- Select a target verification technology field
- Select a Verification Management Organization
- Subcontract operation of verification tests to the Verification Management Organization and bear the costs
- Approve a protocol for verification tests
- Approve a Verification Organization
- Subcontract operation of verification tests to the Verification Organization and bear the costs
- Approve a Verification Report
- Create an Environmental Technologies Verification database for their dissemination
- Provide the logo for the verified technology.

### 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 selection of a Verification Management Organization
- Offer advice on the comprehensive evaluation of verification of test results

### 3. Verification Management Organization

- Prepare a protocol for a verification test and obtain approval of the Ministry of the Environment.
- Select Verification Organizations and obtain approval of the Ministry of the Environment.
- Approve target verification technologies
- Determine the items of the fee associated with the verification test and collect the fee
- Subcontract operation of verification tests to the Verification Organization

### 4. 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 (dichloromethane and other organochlorine degreasing agent treatment technologies)
- 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

### 5. Verification Organizations

- Administer the verification test under the auspices of the Ministry of the Environment or



#### Verification Management Organizations

- Construct the quality management system shown in Appendix 0
- Collect and assess target verification technologies
- Establish and administer respective Technology Panels
- Establish a Test Plan in cooperation with environmental technology developers
- Calculate the fee required in a verification test
- 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

#### 6. Technology Panels

- Offer advice on the selection of target verification technologies
- Offer advice on the preparation of 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

#### 7. 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. Outline of a technology
- c. In-house test results
- d. Product data
- e. Developmental status and past delivery record
- f. Technological novelty
- g. Other relevant or unique features (if any)
- h. Technical specification for the target verification apparatus (Designing purpose should be included) \*
- i. O&M manual (Management contents should be included) \*

(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 formulate a Test Plan in a suitable manner?
  - Is it possible that a verification applicant bear the cost for a verification test?
- 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?

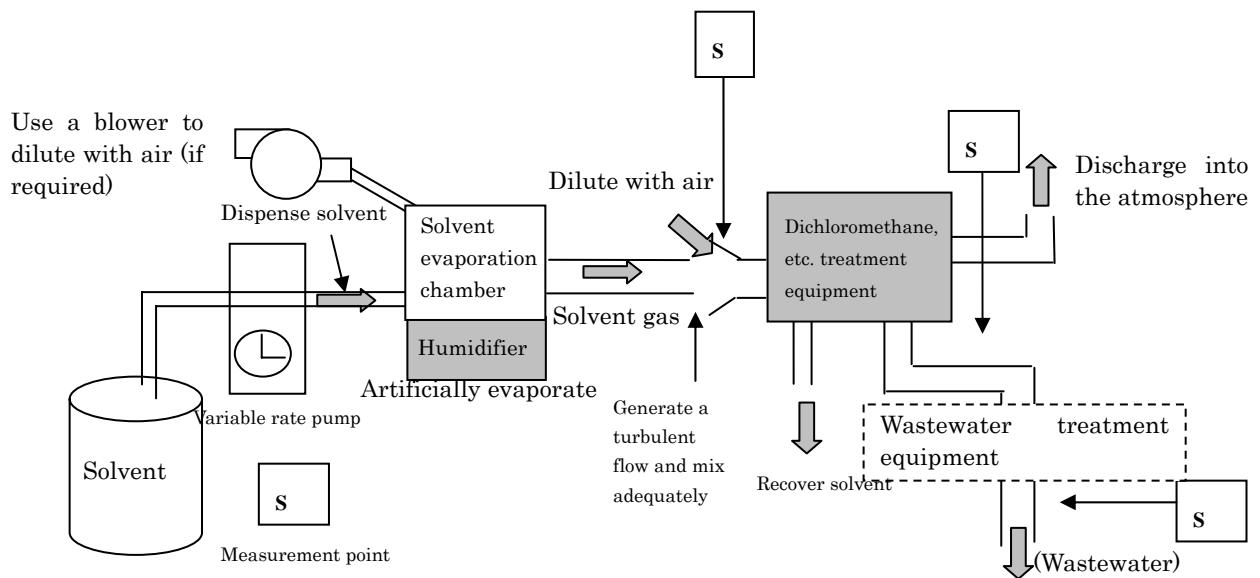
In the selection stage, a verification applicant can confer with the Verification Organization concerning the specific methods of verification, including the period and date of tests. In addition, the selection results of each applied technology shall not be opened, in principle.

## IV. Preparation for the verification tests

### 1. Determination of verification items

This verification test uses gas artificially generated from solvent (dichloromethane or other organochlorine degreasing agents). 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. In addition, the amount of solvent recovered and the recovery rate, which vary according to the amount of solvent accumulated within the equipment, may apparently fluctuate in a test of short duration like this verification test.

**Fig. 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. The possible verification items to be examined for reference are shown 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**

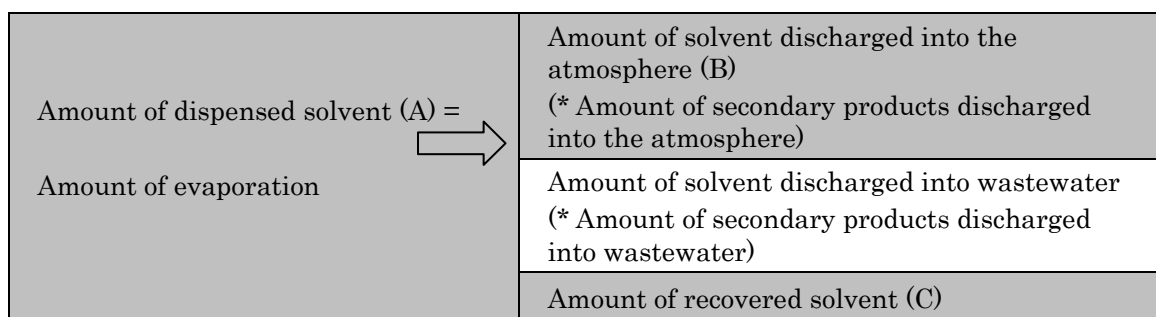
Verification items	Description
Concentrations of dichloromethane, etc.	Concentrations of dichloromethane, etc. at the inlet and outlet ducts of dichloromethane, etc. treatment equipment. Also determine the concentration of the solvent, etc. at the outlet duct when the equipment is not in operation.
Treatment rate	The mass balance that is calculated from the total amount of dichloromethane or other solvents dispensed into the treatment equipment for dichloromethane, etc., and the total amount of the above solvents discharged from the equipment.
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 Reference data to be recovered**

Reference 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 16.

**Fig. 3 Image of waste gas treatment performance**



\* Treatment rate =  $(A - B) / A$

\* Recovery rate =  $C / A$

\* 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.

## (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	Production of wastewater	Concentration of solvent, pH, chloride ion concentration, acid content (alkali consumption), COD, and BOD in wastewater produced when equipment is in operation and not in operation (in post-processing, etc.) and amount of wastewater	—
	Production of secondary products	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
	Production of waste products	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 (7 hours)) (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	Installation site constraints	Requirements of degreasing equipment to which the equipment under test can be attached, weight load (when installed on a roof), etc.	—
	Measures in the event of power failure or other problems	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.

The test conditions shown below are on the assumptions that the process is performed manually using degreasing equipment with an opening area of 0.5 · 1.5 m<sup>2</sup> in light of the practices of small- and medium-sized plating businesses. Moreover, a Verification Organization shall consider more detailed test conditions in view, among other concerns, of the actual conditions in which degreasing equipment is used 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 Table 6, Figures 4 and 5 by a variable rate pump, the solvent evaporator shall supply solvent gas by heating and vaporizing the solvent.
- The amount of solvent supplied by a variable rate pump is set at two different amounts for the two different patterns: pattern A, which repeats a high concentration and zero concentration to examine the response to high concentration gas, the response to the total amount of solvent dispensation, and the responsivity to concentration change (Figure 4); and pattern B, which maintains a low concentration to examine response to low concentration gas (Figure 5). The Verification Organizations shall perform one operation of continuous operation for seven hours for each of the two patterns.
- The amount of solvent supplied by a variable rate pump is determined based on the constants calculated from the following: the test environment temperature, which is set by the Verification Organizations; the volume of air sucked in, which is set by the environmental technology developer; and the relative vapor pressure (vapor pressure / saturated vapor pressure), which is determined by the Verification Organizations with this protocol for the verification test as a guide (Tables 7 and 8).
  - The solvent gas is sucked in by a blower, etc. of the apparatus being tested for verification while being diluted with air in the room. The volume of air sucked in shall be set by the Verification Organizations in consultation with the environmental technology developer, and the adequacy of the air volume being set with respect to the opening area (i.e., 0.5 - 1.5 m<sup>2</sup>), which is shown in the test protocol as an example, shall be clearly stated in the Test Plan.
  - Verification Organizations shall study the minimum temperature of the test room conceivable during the test period, and set the temperature as the test environment temperature.
  - Verification Organizations shall take verifiability into consideration in setting up the relative vapor pressure with the conditions in which degreasing equipment is used by small- and medium-sized plating businesses in mind.
- The purpose of using the test patterns for one operation is to keep track of the discharged gas treatment performance, environmental impact, resources used, etc. in one day operation (24 hours). Verification Organizations shall take this point into consideration in establishing a Test Plan.
  - For instance, if two-tower-type adsorption equipment is used or the equipment has areas that trap solvent; running-in shall be carried out to reproduce the conditions when operation was halted the previous day (i.e., to reproduce the conditions of the adsorption tower to which solvent remains adsorbed) before setting up the verification experiment plan that assumes the amount of treatment is the equivalent of one-day treatment.
  - 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.

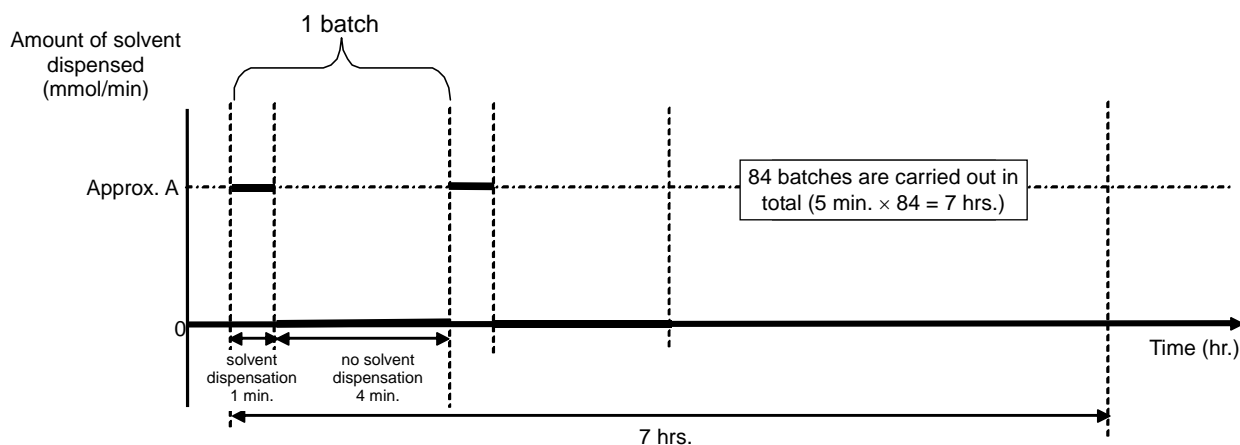
- The entire system including wastewater treatment equipment is considered as a target verification apparatus. Thus if wastewater treatment is required, wastewater produced as a result of treatment shall also be monitored (if gas discharged following aeration in wastewater treatment equipment is returned 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	Description
A	Approx. $84 A \times 10^3$ mmol/operation (7 hrs)	A pattern in which high concentration and zero concentration is repeated; the duration of one operation is 7 hours
B	Approx. $42 A \times 10^3$ mmol/operation (7 hrs)	A pattern that maintains low concentration; the duration of one operation is 7 hours

\* The total amount of dispensed solvent “A” is a constant calculated from the test room temperature, which is set by the Verification Organizations, the volume of air sucked in, which is set by the environmental technology developer, and the relative vapor pressure (vapor pressure / saturated vapor pressure), which is set by the Verification Organizations with this protocol for the verification test as a guide (Table 7).

**Fig. 4 Overview of pattern A**

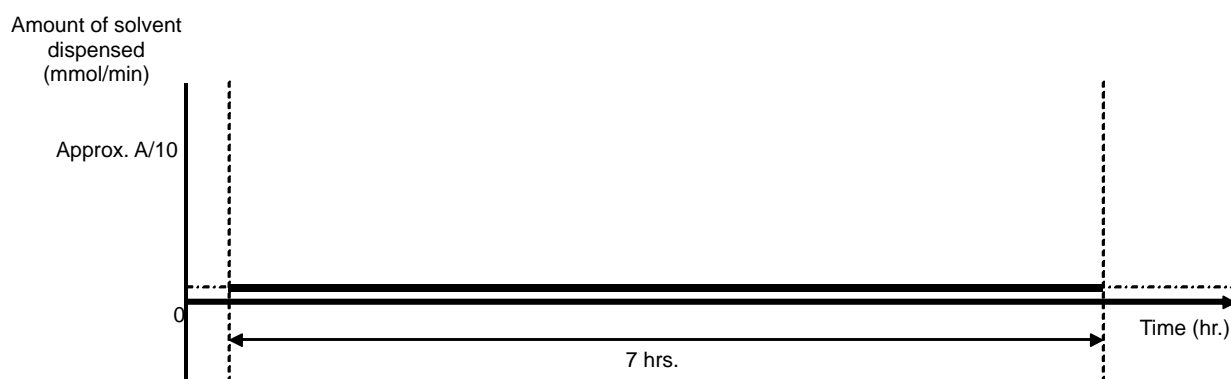


Process	Time (min.)	Amount of dispensed solvent (mmol/min.)
Solvent dispensation	1	Approx. A
No solvent dispensation	4	0

\* Molecular weight of dichloromethane: 84.9, molecular weight of trichloroethylene: 131.4

\* Constant “A” is calculated from the test room temperature, which is set by the Verification Organizations, the volume of air sucked in, which is set by the environmental technology developer, and the relative vapor pressure (vapor pressure / saturated vapor pressure), which is set by the Verification Organizations with this protocol for the verification test as a guide (Table 7).

**Fig. 5 Overview of pattern B**



Process	Time (min.)	Amount of dispensed solvent (mmol/min.)
Solvent dispensation	420	Approx. A/10

\* Molecular weight of dichloromethane: 84.9, molecular weight of trichloroethylene: 131.4

\* Constant “A” is calculated from the test room temperature, which is set by the Verification Organizations, the volume of air sucked in, which is set by the environmental technology developer, and the relative vapor pressure (vapor pressure / saturated vapor pressure), which is set by the Verification Organizations with this protocol for the verification test as a guide (Table 7).

**Table 7 Formula to calculate constant A (the maximum amount of solvent dispensed per time [test pattern A, solvent dispensation process])**

$A = a \times p \times V / (R \times T)$ <p>A: Amount of solvent dispensed (mmol/min) = Constant A                      a: Relative vapor pressure (kPa/kPa: to be determined for each target technology)                      p: Saturated vapor pressure of the solvent (at the test environment temperature: kPa)                      V: Air volume being sucked in (to be determined by the Verification Organizations in consultation with the environmental technology developer: m<sup>3</sup>/min)                      R: Gas constant (8.314 × 10<sup>-6</sup> (m<sup>3</sup>.kPa/K.mmol))                      T: Test environment temperature (K) (K (Kelvin) = 273 + t (°C))</p>
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\* Typical values of the relative vapor pressure “a” would be around 0.007 for target technology (1), and around 0.50 for target technology (2) (Appendix 4: Reference regarding the setting of relative vapor pressure).

**Table 8 Saturated vapor pressure for solvents (reference)**

Temperature (°C)	Dichloromethane (kPa)	Trichloroethylene (kPa)	Temperature (°C)	Dichloromethane (kPa)	Trichloroethylene (kPa)
15	38.37	6.10	23	53.61	9.02
16	40.05	6.41	24	55.82	9.45
17	41.80	6.74	25	58.10	9.90
18	43.60	7.08	26	60.45	10.37
19	45.47	7.44	27	62.88	10.86
20	47.41	7.81	28	65.39	11.37
21	49.41	8.20	29	67.97	11.90
22	51.47	8.60	30	70.64	12.44

**(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 9.

- 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 9 Method for measuring flow rates**

Test condition	Method
Flow rate	<p>Flow velocity of waste gas shall be measured continuously using a pitot tube or a thermal anemometer. The measurements shall be multiplied by the section area of the duct to calculate flow rates.</p> <p>(i) Measurement of flow velocity using a pitot tube</p> $V = C \times (2P_d/\gamma)^{1/2}$ $\gamma = \gamma_0 \times \{273 / (273 + \theta_s)\} \times \{(P_a + P_s) / 101.3\} \quad P_d = P_1 - P_s$ <p>V: Flow velocity (m/s)      P<sub>d</sub>: Dynamic pressure of waste gas (Pa)    γ: Density of waste gas (kg/m<sup>3</sup><sub>N</sub>)</p> <p>θ<sub>s</sub>: Temperature in the measuring system (°C)    P<sub>a</sub>: Atmospheric pressure (Pa)    γ<sub>0</sub>: Density of waste gas (kg/m<sup>3</sup>)</p> <p>P<sub>s</sub>: Static pressure (pressure in the measuring system: Pa)</p> <p>P<sub>1</sub>: Total pressure (pressure to push against fluid (confining liquid) in the measuring system: Pa)</p> <p>(ii) Calculation of the flow rate of waste gas</p> $Q = A \times V \times \{273 / (273 + \theta_s)\} \times \{P_s / 101.3\} \times 60$ <p>Q: Flow rate of waste gas (m<sup>3</sup><sub>N</sub>/min.)    V: Section area of the duct (m<sup>2</sup>)</p>

### 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 10 and Table 11.

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 10 Measurement methods for verification items regarding waste gas treatment performance**

Verification items	Method
Concentrations of dichloromethane, etc.	<p>A continuous total hydrocarbon analyzer shall be used to measure the concentrations of dichloromethane, etc. in the inlet duct of the target verification apparatus.</p> <p>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.</p> <p>Concentrations in the outlet duct shall also be measured when the equipment is not in operation as required.</p>
Treatment rate	<p>The treatment rate shall be determined based on the concentration and quantity of flow of dichloromethane or other solvents at the inlet duct or outlet duct of the apparatus that is the subject of verification. Data for outlet concentration shall be obtained by the continuous total hydrocarbon analyzer or gas chromatography-mass spectrometry.</p>
Recovery rate	<p>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.</p>

**Table 11 Measurement methods for reference items**

Reference items	Description
Properties and components of recovered solvent	<p>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).</p>

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

The measurement methods for the verification items regarding environmental load are summarized in Table 12.

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 12 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 13.

The unit prices for estimation of the cost of electricity, water, and others shall be set appropriately by the Verification Organizations. In establishing unit prices, it is assumed that the type of power supply contract is that of high voltage electric power for commercial use, and the monthly water use ranges between 500 and 1,000 m<sup>3</sup> with the practices of typical small- and medium-sized plating businesses in mind.

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

**Table 13 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.)
- Overview and objectives of verification test
- 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 (i.e., the type of target technology, solvent used, air volume, test environment temperature, relative vapor pressure, etc.) 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 measurement and analytical results 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.”

#### (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
- Total amount of dichloromethane, etc. dispensed and discharged, and the treatment rate (mass balance)
- 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
- Findings 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

## **4. Fees**

### **(1) Setting up and collecting fees**

Among all the expenses for the verification test, the environmental technology developer shall bear the fees for three of the expense items: "measurement, analysis, and the like," "expendables associated to testing," and "travel expenses (i.e., of the Verification Organization)."

When announcing a call for the submission of target verification technologies, the Verification Organization shall determine the estimation of these three items, register the estimated fee at the

Verification Management Organization, and explicitly show the amount of the estimated fee at the time of the announcement. The major contents of the fee items that need to be calculated are shown in (2), and the Verification Organization shall determine the estimated fees in consultation with the Verification Management Organization as necessary. In this field, the ratio of fixed cost (equipment cost) is large among the costs related to a verification test and the fee fluctuates significantly by the number of applications because simulation equipment is used in the test. The Verification Organization desirably opens the fact that the fee will fluctuate by the number of applications or the content of an applied technology when collecting target technologies. In addition, the Verification Organization desirably reduces the ratio of the fixed cost, which causes fluctuation of the cost as great an extent as possible.

After developing the Test Plan but before starting the verification test, the Verification Organization shall finalize the amount of the test fee and the due date of the payment, on which an adjustment has been made with the Verification Management Organization, and provide notification of the above information to the environmental technology developer. The amount of fee shall be determined in consultation with the Verification Management Organization and the environmental technology developer as necessary. In principle, the payment due date shall be before the starting date of the verification test. The environmental technology developer shall receive the above notification, and make a payment for the fee to the Verification Organization by the due date.

When presenting the finalized test fee, the Verification Organization shall ensure that the environmental technology developer be informed that verification items and incurred fees may be added in the course of the verification test; and when the addition of a test item and fee is made, the Verification Organization shall discuss with the Verification management Organization and the environmental technology developer.

If a verification test was not completed for any reason, the Verification Organization shall explain the circumstances for the incompleteness to the Ministry of the Environment and Verification Management Organization to obtain an approval from them, then discuss with the environmental technology developer, calculate the expenses involved in the portion of the test carried out, and determine the revised amount of fee, which needs to be paid by the environmental technology developer.

- Measurement, analysis, etc.

This fee item is expenses, such as measurement associated with verification items of waste gas treatment performance (including reference items) and environmental load, analysis, and the O&M item survey, and mainly the following expenses are included:

- Labor costs (measurement and analysis of verification items of waste gas treatment performance (including reference items) and environmental load, operation and survey of O&M items and monitoring items, and others)
- Wages for assistant personnel (measurement and analysis of verification items of waste gas treatment performance (including reference items) and environmental load, operation and survey of O&M items and monitoring items, and others)
- Subcontracted analysis cost (including dissolvent and waste water analysis)
- Equipment costs (simulation device, syringe, heater, pump, separating funnel, etc.)
- Rental fees of measurement equipment (wind speed calculator, gas meter, gas chromatograph, total hydrocarbon analyzer, thermometer and hygrometer, etc.)

However, if a Verification Organization possesses measurement equipment necessary for measure of each verification item, it does not need to include the cost.

- Expendables associated with the test

This fee item is the expenses for the expendables accompanying the implementation of the test. Mainly the following expenses are included.

- Cost of dissolvent (dichloromethane and trichloroethylene) and normal gas fee

- Cost of sampling bags
- Chemical expense
- Power fee
- Travel expenses (i.e., of the Verification Organization)

This item is the expenses of travel to the Test Site, which are made by the Verification Organization, and the typical expenses are as follows:

- Expenses of public transportation (e.g., fare, express fare)
- Expenses of vehicle use (e.g., vehicle use fee, fuel fee, highway toll)
- Daily travel allowances
- Accommodation fees
- Other

The Verification Organization can include general administrative costs in the fee as necessary.

## 5. Change and cancellation of verification tests

### (1) Addition of verification items by request of the environmental technology developer

When addition of verification items is requested by the environmental technology during the verification test, the Verification Organization shall make an assessment whether it is an appropriate revision in light of the purport of the project, which is the objective verification by the third party, in consideration of the opinions of the Technology Panel, and may make revisions of the Test Plan in consultation with the Verification Management Organization and the environmental technology developer.

In the case that revision of the test fee arises due to the change, the Verification Organization shall determine a new amount of the test fee, which should be paid by the environmental technology developer in consultation with the Verification Management Organization and the environmental technology developer. Once the new fee is set, the Verification Management Organization shall promptly conduct paperwork for collecting supplemental fee from the environmental technology developer.

### (2) Cancellation (declining) of test by request of the environmental technology developer

When cancellation (declining) of the verification test is requested by the environmental technology developer during the course of the verification test, the Verification Organization shall report about the request of cancellation to the Ministry of the Environment and the Verification Management Organization to obtain an approval, and cancel the test.

In the case that revision of the test fee arises due to the change, the Verification Organization shall determine a new amount of the test fee, which should be paid by the environmental technology developer in consultation with the Verification Management Organization and the environmental technology developer. (※) Once the new fee is set, the Verification Management Organization shall promptly conduct paperwork for the refund of the test fee to the environmental technology developer.

Note (※): The environmental technology developer shall bear the portions of cost that was required up to the point of cancellation. For the remainder portion of the paid-fee that has not been used by the time of cancellation, the Verification Organization shall determine whether or not to refund and use it for the research of technological improvement, etc. in consultation with the Verification Management Organization and the environmental technology developer. The Verification Organization shall provide the environmental technology developer the portion of the test data, which was obtained by the costs borne by the environmental technology developer.

### (3) Addition of test items by judgment of the Verification organization

When the Verification Organization has judged that addition of test item(s) is necessary in light of

the purport of the project, which is the objective verification by the third party, <sup>Note (\*)</sup> the Verification Organization shall make a revision to the Test Plan in consultation with the Verification Management Organization and the environmental technology developer. <sup>Note (\*2)</sup>

In the case that the revision of the test fee arises due to the change, the Verification Organization shall determine a new amount of the test fee which should be paid by the environmental technology developer in consultation with the Verification Management Organization and the environmental technology developer. Once the new fee is set, the Verification Management Organization shall promptly conduct paperwork for collecting supplemental fee from the environmental technology developer.

Note (\*): The situations include the cases in which some secondary impact, which was not expected at the time of planning, has been observed, and therefore it is judged that the verification item(s) should be added.

Note (\*2): If an agreement was not reached with the environmental technology developer regarding the revision of the test, the Verification Organization shall obtain an agreement from the environmental technology developer regarding the entry of description to the Test Report stating that the portion of data for the items, which should be measured based on the judgment of the Verification Organization, has not been obtained.

## 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 9001:2000 (ISO9001:2000) "Quality management systems - Requirements," 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 (ISO 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.



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 <sup>2</sup> ( 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	m <sup>3</sup> /min	m <sup>3</sup> /min
Solvent concentration	PPM	PPM

**【Performance evaluation】**

Treatment rate	<p style="text-align: center;">%</p> <p>* 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</p>
Recovery rate	<p style="text-align: center;">%</p> <p>* 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</p>

\* 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)		
Installation site constraints	Requirements of degreasing equipment to which equipment under test can be attached and other special remarks	
	Weight constraints and other special remarks when installed on a roof	
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
<p>Approximate cost</p> <p>Examples of expense items of the initial cost: Installation cost, construction cost, etc.</p> <p>Examples of expense items of the running cost: Consumables, disposal of secondary products, electricity, etc.</p>	Initial cost			
	Total			
	Running cost (per day (24 hours))			
	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. Technological novelty, etc.

Describe the novelty of the technology, status of application/acquisition of patents, utility model rights, etc., presence or absence of published papers on the technology, awards, and the verification test by official organizations.

7. 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 dichloromethane and other organochlorine degreasing agents, 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 dichloromethane or other organochlorine degreasing agents, 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
- Optimization of operation and environment

## 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 dichloromethane or other organochlorine degreasing agents 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. Details of the verification test

#### (1) Test conditions

- Test period and schedule
- Description of target technology
- Type of solvent used
- Test environment temperature
- Relative vapor pressure
- Air volume setting and the reason for the setting

#### (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. Environment, sanitation, and safety

In the Test Plan, the relevant environmental issues, the potential risk involved in the verification test and the verification testing site shall be specified; furthermore, the prevention of such problems shall also be specified.

8. Audit

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

9. 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 (Provisional version)

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
(Clearly state the boundaries of the verification item (i.e., main body and accessories))	

#### 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
Solvent type to be used and components				

##### ○ Settings for verification test conditions

Description of target technology	Combined use of localized exhaust device: not used / used (target technology 1 / 2)
----------------------------------	--

	Solvent used	Test environment temperature	The volume of air to be treated by the target verification apparatus
Conditions		°C	m <sup>3</sup> /min

	Pattern A	Pattern B
Total amount of solvent dispensed	g	g

### 3. Results of the verification test

○ Verification items regarding waste gas treatment performance

◆ Pattern A

Treatment rate: Calculated from the amount of solvent dispensed and the amount of solvent discharged to atmosphere

Recovery rate: Calculated from the amount of solvent dispensed and recovered

The amount of solvent recovered varies depending on the amount of solvent trapped inside of the equipment; therefore, it may apparently fluctuate in a short duration test such as this verification test.

#### 【Evaluation results of waste gas treatment performance】

Item		Inlet	Outlet
Temperature		°C	°C
Flow rate		m <sup>3</sup> /min	m <sup>3</sup> /min
Concentrations in waste gas	Maximum value	ppm	ppm
	Mean value	ppm	ppm

Item		Evaluation of performance
Treatment rate		%
Solvent recovery	Amount of recovered solvent	g
	Recovery rate	%
Test room conditions	Measured temperature	°C
	Measured humidity	%

#### 【Changes in concentration】

◆ Pattern B

#### 【Evaluation results of waste gas treatment performance】

Item		Inlet	Outlet
Temperature		°C	°C
Flow rate		m <sup>3</sup> /min	m <sup>3</sup> /min
Concentrations in waste gas	Maximum value	ppm	ppm
	Mean value	ppm	ppm

Item		Evaluation of performance
Treatment rate		%
Solvent recovery	Amount of recovered solvent	g
	Recovery rate	%
Test room conditions	Measured temperature	°C
	Measured humidity	%

#### 【Changes in concentration】

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◆ Properties and components of recovered solvent (reference)

--

○ Verification items regarding environmental load

Item	Results							
Production of wastewater	Test conditions	Production amount (mL/operation)	Dichloromethane, etc. concentration (mg/L)	pH	Cl- concentration (mg/L)	Acid content (alkali consumption) (mg/L)	COD <sub>Mn</sub> (mg/L)	BOD (mg/L)
	Pattern A							
	Pattern B							
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.)							

\* Duration of 1 test run is 7 hours

○ 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		

\* Duration of 1 test run is 7 hours

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. Also include costs required in post-processing for running cost.)		Initial cost		
			×	
			×	
			×	
		Total		
		Running cost per day (24 hours)		
		Total		

\* Note that the charge rate for electricity and water differs depending on the installation location

○ Other information provided by the manufacturer

<p>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</p>
---

## Appendix 4: Reference regarding the setting of relative vapor pressure (FY2005)

In this test protocol, relative vapor pressure is defined as the value of the vapor pressure divided by the saturated vapor pressure. This determines the relative amount of solvent to be dispensed when solvent gas is sucked into the verification target equipment given the volume of air sucked in and test environment temperature.

Among the information organized in the discussion of the working group (FY2004), issues that are useful for the setting of the relative vapor pressure are shown below. Note that the following are based on limited information, and it is desirable that the Verification Organizations collect information pertinent to degreasing equipment uses for the technology the application was filed for in setting up the relative vapor pressure. The major study on the setting will be carried out by the Verification Organizations and the Technology Panels.

### ● Information organized by the working group (FY2004) regarding relative vapor pressure

	Information organized by the working group	Examples of relative vapor pressure values calculated based on the information in the left column
Target technology 1	According to the data from a plating business in the Tokyo Metropolitan District, in the case of trichloroethylene, the maximum concentration of the solvent gas is approximately in the range between 600 - 1,000 vol ppm (from Document 3, the 3rd WG meeting in FY2004).	Since the vol ppm values of the gas equals the partial pressure ratio, the vapor pressure is accordingly about 0.06 to 0.1 (kPa). For 600 ppm, the vapor pressure will be, $600 / 1,000,000 \times 101.324$ (kPa) $\approx 0.06$ (kPa). The saturated vapor pressure for trichloroethylene (assuming that the temperature is the typical room temperature, 20°C) is 7.81 (kPa), thus <u>the relative vapor pressure is <math>0.06 / 7.81 = 0.0077</math></u> .
	According to the data from a plating business in the Tokyo Metropolitan District, in the case of dichloromethane, the maximum concentration of the solvent gas is approximately in the range between 3,000 vol ppm (from Document 3, the 3rd WG meeting in FY2004).	Calculating the vapor pressure in the same manner as the above gives 0.30 (kPa). The saturated vapor pressure for dichloromethane at 20°C is 47.41 (kPa); thus, <u>the relative vapor pressure is 0.0063</u> .
Target technology 2	According to the information collected as a public comment, in the case of dichloromethane, the maximum concentration of the solvent gas is approximately in the range of the order of tens of thousands to one hundred thousand vol ppm (from Document 3, the 4th WG meeting in FY2004).	In the case of 100,000 ppm, the vapor pressure is calculated to be 10.13 (kPa) in the same manner as above; the saturated vapor pressure for dichloromethane at 20°C is 47.41 (kPa); thus, <u>the relative vapor pressure is <math>10.13 / 47.41 = 0.2137</math></u> .
	Compared to the general activated charcoal adsorption method (i.e., corresponding to target technology 1), the pressurized cryogenic method (i.e., corresponding to target technology 2) has a characteristic of low air volume and high concentration, the concentration ratio is approximately 100:1, and the air volume ratio is approximately 1:100 (the ratio of target technology 2 versus 1). (From Doi, Akira, 1994, "From cleaning solvent recovery equipment, pressurized cryogenic method," <i>Factory Management</i> Vol. 40, No. 12)	If the air volume for target technology 1 is 12 m <sup>3</sup> /min, air volume for target technology 2 is 0.12 m <sup>3</sup> /min, the concentration of the latter will be 100 times that of the former. Concentration (ppm) is equal to partial pressure ratio; if the concentration of the trichloroethylene that is sucked in by target technology 1 is assumed to be 600 vol/ppm, the concentration of trichloroethylene that is sucked in by target technology 2 will be 60,000 vol.ppm. Then the vapor pressure will be given to 6.08 (kPa) by calculation, and the saturated vapor pressure for trichloroethylene at 20°C being 7.81 (kPa) will give <u>the relative vapor pressure, <math>6.08 / 7.81 = 0.7785</math></u> .

\* As examples of typical relative vapor pressure values, approximately 0.007 (i.e., the average value of 0.0077 and 0.0063) for target technology 1, and approximately 0.50 (i.e., the average value of 0.2137 and 0.7785) for target technology 2 are given in this test protocol.

The technological fields that are the subject of verification are the treatment technologies that are used as alternatives to local ventilation equipment (i.e., those defined as target technology 1 in the test protocol), and furthermore, the treatment technologies that are used in combination with local ventilation equipment (i.e., those defined as target technology 2 in the test protocol).

In the case of target technology 1, the amount of solvent contained in the air that is sucked in is small, because in the actual situations in which target technology 1 is used, the air is sucked at a location distant from the liquid surface of the degreasing equipment, and the volume of air sucked is large enough to meet the requirement of the Organic Solvent Poisoning Prevention Regulations (Ministerial Ordinance enacted based on the "Industrial Safety and Health Law" and

“Enforcement Order for Industrial Safety and Health Law”). In this case, the relative vapor pressure as a percentage is approximately 1%.

On the other hand, in the actual situations in which target technology 2 is used, the amount of solvent contained in the air that is sucked in is large, because the air is sucked near the liquid surface of the degreasing equipment (i.e., close to the vapor line). In this case, the relative vapor pressure is in the region of 10%. Although varying with the solvent type and temperature, in some instances, the concentration is several hundreds of thousands of ppm from the liquid surface to the area near the cooling tube of the degreasing equipment, and it decreases to between several tens of thousands and several hundreds of thousands of ppm in the area several centimeters above the cooling tube.

It is also expected that verification (i.e., recovery rate measurement, etc.) is sometimes difficult because the total amount of solvent dispensed per one operation is small and solvent may be trapped within the equipment, which is caused by a low air volume, low test environment temperature, and so on. In such cases, it is desirable that the Verification Organizations set up the relative vapor pressure values in consideration of verifiability, while staying in close touch with the actual situations in which such technologies are being used.



# 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 Verification Management Organizations, which prepare a protocol, solicit and select Verification Organizations, and set up and collect fees with Verification Organizations, which conduct verification tests.

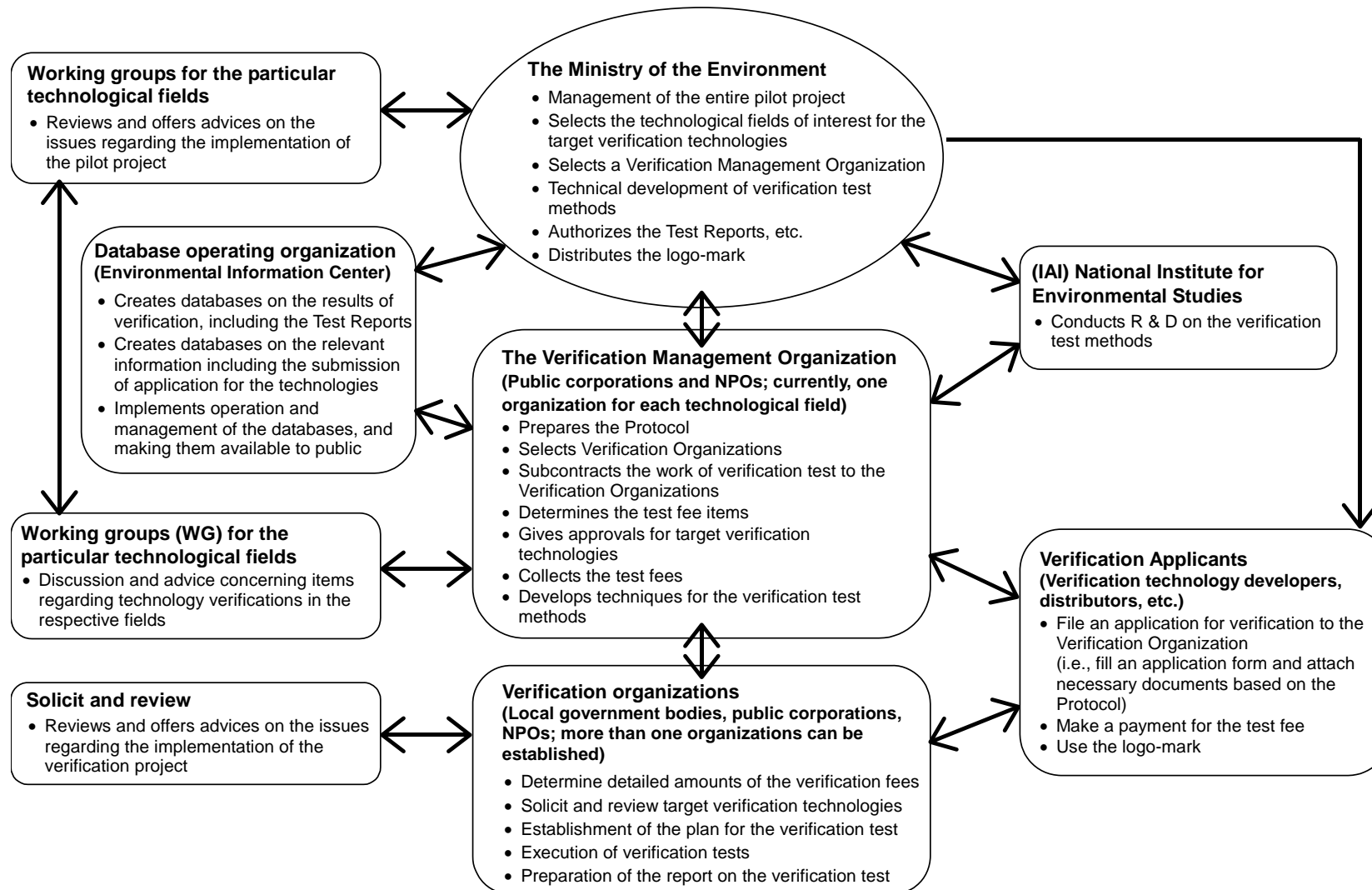
### 4. Procedures of the project

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 shall select a "Verification Management Organization," which is in charge of the preparation of the Protocol, solicitation and selection of Verification Organizations, determination of the test fee items and collection of the fees.
- (4) The Verification Management Organizations will prepare a “protocol for the verification,” which establishes the specific methods of technology verification regarding the selected target verification technology fields.
- (5) The Verification Management Organizations will select the “Verification Organizations,” which are the independent organizations that conduct the verification tests.
- (6) The Verification Organizations will invite applications from companies and the like for the technology to be verified.

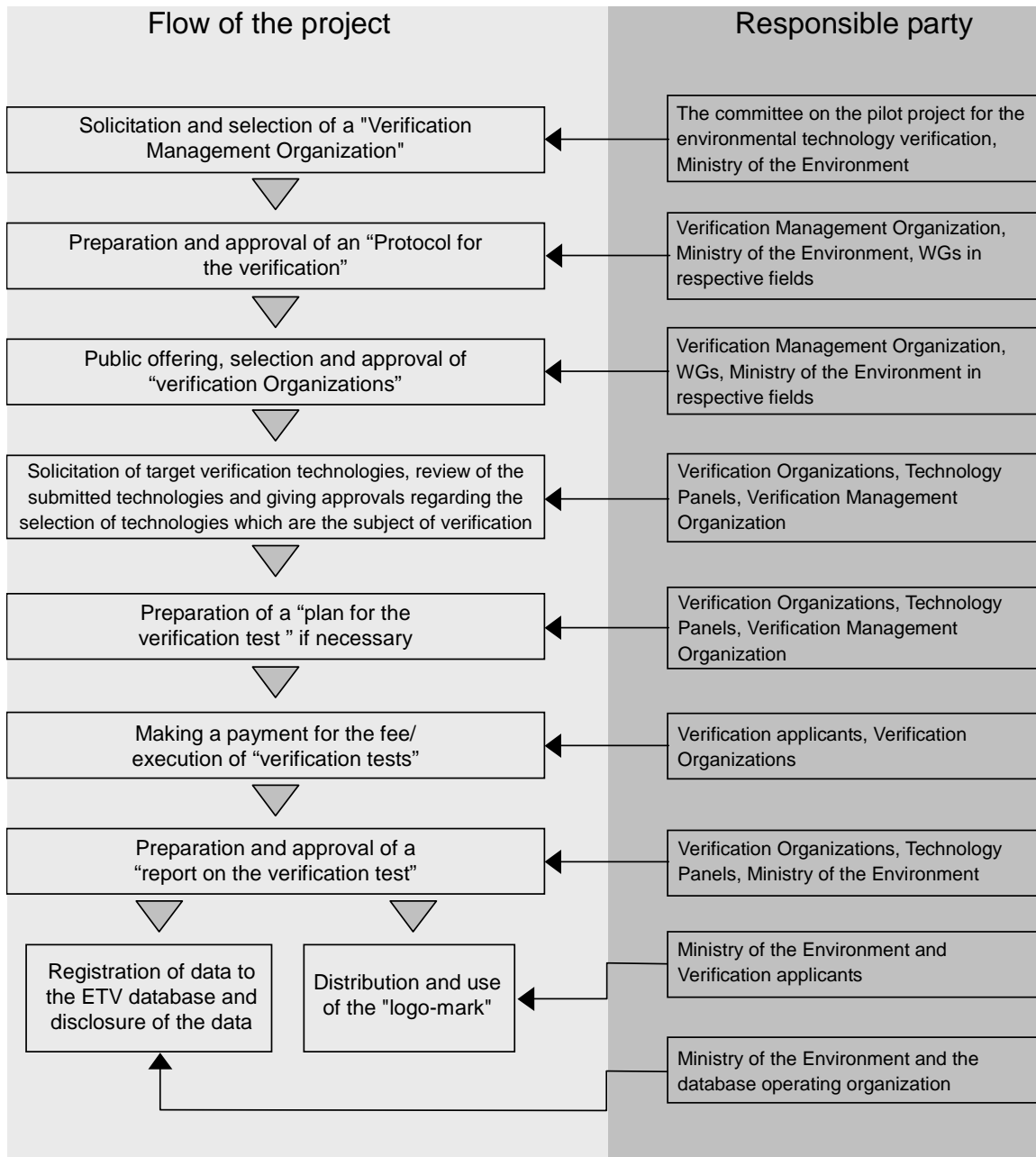
- (7) The Verification Organization shall discuss and review the submitted technologies in its expert committee to select technologies that are the subject of verification.
- (8) The Verification Organizations will conduct verification tests on the selected technologies in accordance with the protocol for the verification.
- (9) The Verification Organization shall organize the test results into a report, which will be given to the Verification Management Organization and the Ministry of the Environment. In addition, the report will be registered in a database on the Internet and made available to the public.
- (10) The Ministry of the Environment will distribute logo-marks to the verified technologies.

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



(Note) In the implementation of the project, a part of the implementation system may be monitored after receiving an approval from the Ministry of the Environment.

### 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 2005

##### 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 (dichloromethane and other organochlorine degreasing agents treatment technology),” the technology fields in which technology verification is scheduled to be conducted in 2005, 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 (dichloromethane and other organochlorine degreasing agents 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**

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

- (i) Issues related to the implementation of the projects under the system collecting fee**
- (ii) Issues related to the implementation of projects that are focused on the future**

##### 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) A subcommittee will be formed to discuss specific issues as necessary.
- (7) 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 FY 2005

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, Environmental Science Laboratory, Tokyo Mekkikogyo Kumiai
Junichi Doi	Executive board member, Japan Industrial Conference on Cleaning
Osami Nakasugi	Professor, Graduate School of Global Environmental Studies, Sophia 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, Environmental Control Technology Office, Environmental Management Bureau
Miyoshi Negishi	Noise control manager, Environmental Control Technology Office, Environmental Management Bureau
Yuko Tanaka	Planning manager, Environmental Control Technology Office, Environmental Management Bureau
Yuichi Nagasaka	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. (Mitsubishi UFJ Research & Consulting Ltd. since  
January 2006)) >

Eiko Saito	Chief researcher, Environmental Policy Consulting Department
Ogi Kanaya	Researcher, Environmental Policy Consulting Department
Takashi Morimoto	Researcher, Environmental Policy Consulting Department
Kotaro Shimizu	Researcher, Environmental Policy Consulting Department



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

(2004)

### 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 dichloromethane and other organochlorine degreasing agents treatment technology

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

- Protocol for the verification tests on dichloromethane and other organochlorine degreasing agents treatment technology (first draft)

August 18, 2004 to September 1, 2004

- Invite public opinion on the protocol for the verification tests on dichloromethane and other organochlorine degreasing agents treatment technology (second draft)

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

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

### Fifth meeting: 10:30 to 12:00. October 28, 2004

- Hearings from the applicant institutions for Verification Organizations for treatment technology of dichloromethane, etc.
- Regarding the selection of the Verification Organizations for treatment technologies of dichloromethane, etc.

### Sixth meeting: 9:30 to 11:30. March 8, 2005

- Review of reports of verification tests on ethylene oxide treatment technologies conducted in 2004
- Review of the protocol for the verification tests on the ethylene oxide treatment technologies (for the preparation of the third edition)
- Reports on the progress of the verification tests on treatment technologies for organochlorine

degreasing agents such as dichloromethane

- Views on the fee-based system (plan) in the future

(2005)

First meeting: 13:00 to 15:00. May 25, 2005

- Review of reports of verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane conducted in 2004.
- Review of the protocol for the verification tests on treatment technologies for organochlorine degreasing agents such as dichloromethane (second edition)
- A call for and the selection of Verification Organizations for the fields of VOC treatment technology (i.e., treatment technologies for organochlorine degreasing agents such as dichloromethane)
- Methods for the future implementation of verification tests in the fields of ethylene oxide treatment technology and VOC treatment technology

Second meeting: 15:00 to 17:00. June 30, 2005

- Interviews with applicants for Verification Organizations of dichloromethane and other treatment technologies
- Selection of Verification Organizations of dichloromethane and other treatment technologies

Working Group meeting: 10:00 to 12:00. November 1, 2005

- Results of the survey on demand for a verification test
- Fee items in a verification test
- Direction of verification test technology field

Third meeting: 15:00 to 17:00. February 15, 2006

- Fee items, results of the survey on demand for a verification test and the future directions
- Review of the protocol for the verification of ethylene oxide treatment technology (third edition)
- Review of the protocol for the verification of ethylene oxide treatment technology (third edition)
- Direction of new technology fields

Revision histories of the protocol for the verification test on treatment technologies for organochlorine degreasing agents such as dichloromethane

First edition Published on October 8, 2004

Second edition Published on June 9, 2005

<Major revisions from the first edition>

- Addition of notes on the handling of recovery rates and treatment rates of the verification items
- Revisions of the test patterns (i.e., the amount of solvent dispensed, time setting)
- The criteria for the calculation of electricity cost and water cost are provided

Third edition Published on March 31, 2006

<Major revisions in the third edition>

- Project implementation system in accordance with transfer to the fee collecting system and the description of fee items, etc. were added.
- Items related to change and cancellation of verification tests were added.