

Interpretation

Product Certification Criteria for “Printing Ink Version 2.1”

Established: Dec.18, 2002

1. Environmental Background

Eco Mark Product Category No. 102 “Offset Printing Ink” was established in 1997. The aim of the eco mark at that time, to reduce air pollution by aromatic components contained in offset printing ink, was prompted by a growing awareness of the importance of environmental problems in the printing ink industry and outsourcers of printed matter. The efforts showed outstanding results, with 87.4% of all printing inks switched to aromatic-free types (estimate of Printing Ink Makers’ Association). In the review for Version 2.0 certification criteria, focus was placed on advancing current efforts another step by further reducing volatile organic compounds (VOCs) such as aromatic components.

Since the establishment of the certification criteria, the scope of printing inks containing aromatic-free solvents has covers petroleum “offset lithographic ink” and “news inks,” excluding other printing inks whose components differ from petroleum printing inks considerably. With a high demand for certain printing inks such as those used for special gravure printing (115,960 tons in 2000: based on *Kagaku-kougyo-toukei-nenpo*, issued by METI), the significance of covering these types of printing inks in the Eco Mark Product Category is high. In this review, adjustments and studies were carried out to prevent limiting the scope to only some product groups without a specific reason, in the recommendation of printing inks with a relatively slight impact on the environment as compared to other similar products.

2. Applicable Products

The first version of this Certification Criteria (Version 1.0) established in 1997 covered “offset lithographic ink” and “news ink.” In reviewing the criteria for Version 2.0, gravure ink and resin typographic ink were also included, given the need to cover printing inks that have a large market scale, are closely related to the lives of general consumers, and are produced in large volumes. In particular, since no measures on the recovery of solvents during the printing process are devised for most of the gravure inks used for printing on substrates other than paper, there is a need to promote VOC reduction measures of the products themselves, explaining the enormous significance of including these printing inks in the Eco Mark Product Category. However, gravure inks used for publishing contain only one type of solvent, and actually printing companies are taking recovery, recycling, and reuse measures to prevent the discharge of VOCs into the atmosphere. In addition, since it is impossible to introduce an effective criterion to differentiate a product that is a leader from an

environmental perspective, such gravure inks were not included in the category. On the other hand, UV inks, though produced only in small volume, have more or less no VOC components, and those that have no deinking problems, a factor which interferes with the recycling of used paper, were included in this Product Category because it is a printing ink with an entirely different drying mechanism. For resin typographic inks, water-based types originally have minimal VOC components, and were therefore taken up in this Product Category as the recommended printing ink in the hope that it would help further promote the reduction of VOC. In the case of screen inks, due to the diversity of the substrate, ink components not only differ vastly by type, but there are also very special types of screen inks like resist ink used for electronic parts and printed wiring. Upon reviewing these conditions and concluding that it would be difficult to establish criteria for this group of printing inks, screen inks were excluded from Version 2.0. Other special printing inks (carbon ink, fluorescent ink, magnetic ink, OCR ink, mimeograph ink, perfumed ink, IR ink, etc.) were also excluded due to limitations to printing purposes, as well as small production volume. After announcing the draft criteria, comments were made from the public suggesting that aromatic-free diluents should be included in the list of applicable products. Composition of diluents is different from that of inks, however, and the criteria of diluents, if any, would only bring poor result since it largely depends on the awareness of printers. Therefore, diluents were excluded from the list.

3. Terminology

In the first version of this Certification Criteria (Version 1.0) established in 1997, the scope of regulation was aromatic hydrocarbon compounds detected from solvents based on the JIS petroleum products component test (Japan Industrial Standards JIS K2536) from the perspective of reducing aromatic components contained in petroleum solvent.

In the review for Version 2.0 of this Certification Criteria, VOCs were focused on the whole in addition to aromatic components. For VOCs, the January 2002 Interim Report by the Ministry of Health, Labor and Welfare Sick House Committee (*Shikku Hausu Kenkyu-kai*) set down indoor concentration indicators on 12 substances including formaldehyde, toluene, and xylene. The VOC definition generally used is that by the World Health Organization (WHO). In Version 2.0, WHO's classification of chemical substances is cited for the scope of VOC defining as volatile organic compounds that are grouped into "Very Volatile Organic Compounds" and "Volatile Organic Compounds." Very volatile organic compounds are those whose measured boiling points range from $<0^{\circ}\text{C}$ to $50\text{-}100^{\circ}\text{C}$, while volatile organic compounds are those whose measured boiling points range from $50\text{-}100^{\circ}\text{C}$ to $240\text{-}260^{\circ}\text{C}$. Though it is ideal to set down criteria for VOCs as total volatile organic compounds (TVOCs), Certification examination according to Version 2.0 does not cover "semi volatile organic compounds" and "particulate organic matter" which exceed the above ranges from the following reasons: the boiling point range of substances designated as especially hazardous is distributed between 0°C and 200°C ; there is little risk of substances with high boiling points to become volatile at room temperature; and there

is an inevitable need to allow the use of solvents required at least from the composition of printing ink.

Table: Classification of Chemical Substances
by World Health Organization (WHO)

Group	Abbreviation	Range of Boiling Point
Very Volatile Organic Compounds	VVOC	<0° C - 50-100° C
Volatile Organic Compounds	VOC	50-100° C - 240-260° C
Semi Volatile Organic Compounds	SVOC	240-260° C - 380-400° C
Particulate Organic Matter	POM	> 380° C

4. Environmental Criteria

Details of 4-1 Establishing Common Environmental Criteria and 4-2. Individual Environmental Criteria

For setting up the criteria, environmental impacts over the whole life cycle of a product was considered, using a table “Chart for Environmental Impacts at Each Stage of Product Life Cycle.” As a result, impact items that are considered to be important to establish criteria for Eco Mark certification were selected. For these items, qualitative or quantitative criteria were established.

Environmental impact items considered for the category of “Printing Ink” are as shown in the table “Chart for Environmental impacts at Each Stage of Product Life Cycle” (X and XX in the table). Out of these items were finally selected as the environmental criteria: A-1, B-1, B-2, B-4, B-5, B-7 to 9, B-8, D-1, D-2, D-5, D-7, D-8, E-5, E-7 to 9 and F-7 to 9 (XX in the table). The blank columns in the table show items that were out of the scope of review or which were reviewed in combination with other items. Following is the details of establishing environmental criteria.

Table: Chart for Selecting Environmental Impact Items at Each Stage of Product Life Cycle

Environmental Impact Item	Product Life Stage					
	A. Resource Extraction	B. Manufac- turing	C. Distribu- tion	D. Use/Con- sumption	E. Disposal	F. Recycling
1.Resource consumption	XX	XX	X	XX		
2.Discharge of greenhouse gases	X	XX		XX		
3.Discharge of the ozone layer depleting substances		X				
4.Destruction of eco systems		XX				
5.Discharge of atmospheric pollutants		XX	X	XX	XX	
6.Discharge of water pollutants		X		X		
7.Discharge/disposal of wastes	X	XX	X	XX	XX	XX
8.Use/discharge of hazardous materials	XX	XX		X	XX	XX
9.Other environmental impacts	X			X	XX	XX

A. Resource Extraction Stage

A-1 Resource consumption

The following points were reviewed under this item:

- (1) Minimum consumption of sub-materials such as activated white clay and sulfuric acid
- (2) Active use of recycle resources
- (3) Use of large amounts of vegetable oil

In the first version of this Certification Criteria (Version 1.0) established in 1997, it was concluded that Item (1) need not be included as a provision of this Certification Criteria because activated white clay and sulfuric acid are normally not used in the manufacturing of aromatic-free solvents (little aromatic components).

When this item was reexamined in the review for Version 2.0, activated white clay was concluded as being a trade-off with the promotion of the use of vegetable oil, because it is used for refining vegetable oil. In addition, due to the difficulty in quantitatively evaluating the volume of vegetable oil used, this item was not included as a provision of this Certification Criteria again.

For Item (2), as active use contributes to reduction of depleting resources and recovery of recyclable resources, this item was included as a provision of this Certification Criteria.

For Item (3), as there have been comments that the use of large amounts of vegetable oil reduces deinking, this item was omitted because it has already been reviewed in Item F-9.

A-2 Discharge of greenhouse gases

The following points were reviewed under this item:

- (1) Reduction of energy consumption in extraction of resources and material transportation stage

This item was reviewed in the first version (Version 1.0) of the Certification Criteria established in 1997. There exist petroleum and vegetable oil based printing inks, and only aromatic-free inks do not always increase energy consumption. Furthermore, it is presently difficult to compare energy consumed between petroleum based and vegetable based printing inks, therefore this item was not included as a provision of this Certification Criteria.

A-7 Discharge/disposal of wastes and A-8 Use/discharge of hazardous materials

The following points were reviewed under this item:

- (1) Volume of wastes such as activated white clay and sub-materials generated and disposed shall be minimum.

This item (1) was omitted because it has already been reviewed in Item A-1.

B. Manufacturing Stage

B-1 Resource consumption and B-2 Discharge of greenhouse gases

The following points were reviewed under this item:

- (1) Reduction of energy consumed in manufacturing stage
- (2) Minimized use of petroleum resources
- (3) (Raw material input/production volume) shall be low.
- (4) Discharge of greenhouse gases shall be low.

For Items (1) and (4), in the first version of this Certification Criteria (Version 1.0) established in 1997, it was argued that the energy consumed during the manufacture of printing ink using aromatic-free solvents should not be more than that of conventional printing inks. Due to the difficulty in setting down a numerical target, it was decided that the energy consumed should not be markedly larger than existing products. These items were included as provisions of this Certification Criteria under the condition that these items were reviewed again in Version 2.0. Since the printing inks concerned in this version were assumed to be produced from the same production lines, the energy consumed would not increase compared to conventional products, and these items were included as provisions of this Certification Criteria.

Item (2) was omitted because it has already been reviewed in Item B-5.

Item (3) was omitted because it has already been reviewed in Item A-1.

B-3 Discharge of the ozone layer depleting substances

The following points were reviewed under this item:

(1) Reduction of ozone layer depleting substances in manufacturing stage

This item was reviewed in Version 2.0., but it was not included as a provision of this Certification Criteria because currently ozone layer depleting substances are not used in the manufacturing stage of printing inks.

B-4 Destruction of eco systems

The following points were reviewed under this item:

(1) Clarification of PRTR-designated chemical substances in manufacturing stage

Pollutant Release and Transfer Register (PRTR) Law (law promoting identification of volume of specific chemical substances discharged to the environment and improvement of management) requires even manufacturers of printing inks to attach material safety data sheets (MSDS) on chemical substances when delivering products to other businesses. The clarification of substances subject to PRTR and appropriate control of use of chemical substances are expected to prevent discharge of these substances into the environment. For these reasons, this item was included as a provision of Version 2.0 of this Certification Criteria, specifying that MSDS related to printing ink should be submitted.

B-5 Discharge of air pollutants

The following points were reviewed under this item:

- (1) Content of aromatic components in solvent used shall be low.
- (2) Reduction of volatile organic solvent content in solvents
- (3) Ignition point of solvent shall be taken into account.

For Item (1), in the review of the first version of the Certification Criteria established in 1997 (Version 1.0), it was decided that the content of aromatic components in petroleum solvent (including oil) should be below 1% volume percentage, which is a level that can be realized by current available technology. Regarding the measurement method, the JIS K 2536 fluorescent indicator adsorption analysis (FIA analysis) specifies that petroleum products whose end points are below 315° C and whose aromatic component content is 5 to 99 volume % should be applicable. Consequently, solvents whose end points exceed 315° C and which have a low concentration of aromatic components such as 1 volume % are excluded from the scope of the FIA analysis. However, because no alternative method exists, and since measuring methods are inconsistent all over

the world, it was prescribed that “JIS K 2536 should be used to measure the solvent component,” and this item was included as a provision of this Certification Criteria. According to the “Manual on Calculation of PRTR Emission, Etc.” (law promoting identification of volume of specific chemical substances discharged to the environment and improvement of management), substances above 1 weight % are required to indicate in the MSDS by law (carcinogens above 0.1%). Substances less than 1% do not need to be indicated. In accordance with this law, the standard value in Version2.0 was revised to less than volume percentage of 1%.

Item (2) was reviewed in Version 2.0, and it was concluded that it is important to cover all VOCs in the Certification Criteria instead of a limited number of aromatic hydrocarbons with high toxicity regulated by the existing criteria to counter air pollution. As the quantity of volatile organic solvents used for printing inks differs vastly according to the type of printing ink, it was decided that standard values will be set for VOC content so that this item (2) is technically feasible for all types of printing ink, and so that the market share of products meeting the Eco Mark Certification Criteria becomes 20% on the whole.

For oil-based printing inks, reducing petroleum solvent reduces VOC emission and helps save petroleum resources. There were some comments that minimization of the use of petroleum resources is closely connected to reduced production costs and stable product supply. With the urgent task of reducing VOC emission, and in order to protect depleting resources, it was decided that criteria should be established on the quantity of petroleum solvents used in printing ink to reduce petroleum solvents. In setting standard values for content rate, the content rate of petroleum solvents contained in yellow printing ink was applied. It was set below 45% for offset rotary ink, and below 30% for sheet-fed printing ink and news ink. In particular, for sheet-fed ink and news ink, the standard values are the same as VOC-free products. For offset rotary ink, the after-burner method, which burns gas emitted from the printer drier in a processing device, is adopted, and it was reported that the generation of hydrocarbons was dealt with. For process inks which make up a large part of offset printing ink, there is a need to lower the viscosity of yellow, as it is printed last. For this reason, solvents are used the most. The minimization of the content of yellow petroleum solvent is therefore the most effective for reducing VOC. In order to reduce solvent for yellow ink, resins that do not increase viscosity even at small amounts of solvents are being developed. Applying this technique to other printing ink colors may contribute to reducing the overall content of solvents in the printing ink.

For gravure ink, one method of reducing VOC is by promoting conversion from solvent-based printing ink to water-based printing ink. Because solvent-based gravure ink is used after diluted to the appropriate viscosity during printing, it was argued that even if VOC components in the product are reduced, it is not possible to reduce the quantity of VOC components discharged. There were other discussions: changing the structure of facilities such as gas emission device in the printing process is expected to be the most effective for reducing VOC emission; and because there is a need to update facilities such as printers for switching from solvents to water, it is difficult to switch the currently mainstream solvent printers to water

type in a short period of time. Compared to gravure ink for paper that can be easily switched to water ink, the absorption of printing ink is poor for plastic films such as polyolefin, polyester, nylon. It was argued that it is technically difficult to switch to water-based ink when features such as good post-processing ability and harmlessness are required as in the case of food packaging. As a result, it was decided that standard values for VOC components will not be applied until the next review in Version 2.0, and only for gravure ink products for film which use aromatic components as the first step in the switch to water ink. Use of methyl ethyl ketone (MEK) in solvents was also reviewed. Since the U.S. Environmental Protection Agency (EPA) is examining a request that MEK should be removed from a list of solvents which need to be reduced by 90 to 95% due to hazardous air pollutants (HAPs) (such as toluene, xylene, ethyl-benzene, and MIBK, etc.), the decision to include this item as a provision of this Certification Criteria was not able to be made in the review for Version 2.0.

For resin typographic ink, the switch to water based inks is nearly complete and VOC standard values have been established. Though the purpose of resin typographic ink for film and solvent based gravure ink for film are the same, resin typographic ink essentially does not contain aromatic components in solvents, and therefore VOC standard values were applied.

Item (3) was not included as a provision in this Certification Criteria since measures based on the Fire Prevention Law, etc. such as showing product classifications on product labels are being taken already.

B-6 Discharge of water pollutants

The following points were reviewed under this item:

(1) No discharge of water pollutants during manufacturing

In the review of the first version of this Certification Criteria (Version 1.0) established in 1997, water pollutants produced in the cleaning of machines during manufacturing were discussed and it was decided that this item (1) need not be included as a provision in the Certification Criteria then.

For Version 2.0, this item (1) was again reviewed, and not included as a provision of this Certification Criteria because water sources used in stages other than manufacturing include moisture used in offset printing methods, but these are issues related to the facilities and work process of printing businesses, and cannot be guaranteed by the manufacturers of printing inks.

B-7 Discharge/disposal of wastes

The following points were reviewed under this item:

(1) Minimum generation of waste during manufacturing
(2) Efforts shall be made for reduction and recycling of waste generated during manufacturing.
(3) No increase in generation and disposal quantity of waste

(4) No discharge of hazardous chemical substances and hazardous metals

For Items (1) to (3), it was concluded that the refining process of aromatic-free solvents offers the advantage of being waste-clay free due to the hydrogenation carried out, and that this advantage is inevitable for realizing aromatic-free products. Consequently, these items were considered not necessary for inclusion as provisions in this Certification Criteria in the review for the first version of this Certification Criteria (Version 1.0) established in 1997.

In the review for Version 2.0, inclusion of Items (1) to (3) were taken into consideration due to the generation of waste-clay in the refining process of vegetable oil. However, based on the difficulties involved in quantitative evaluation, requirement was established as compliance to local pollution prevention regulations, and Items (1) to (3) were included as provisions in this Certification Criteria.

Item (4) was omitted because it has already been reviewed in Item B-8.

B-8 Use /discharge of hazardous materials

The following points were reviewed under this item:

- (1) No discharge of hazardous chemical substances and heavy metals
- (2) No content of hazardous chemical substances and heavy metals in products
- (3) Toxicity of monomers (In the case of reactive inks like UV-curable inks) shall be taken into consideration.
- (4) Low content of petroleum solvent
- (5) Low content of volatile organic solvents in printing inks
- (6) Content of aromatic organic solvents in product is less than 1%

In the review of the first version of this Certification Criteria (Version 1.0) established in 1997, it was decided that Items (1) and (2) shall be applied to restricted substances such as hazardous substances and heavy metals prescribed in the "Self-Imposed Controls on Printing Inks for Food Packaging Materials (Negative List Control)" established by the Printing Ink Makers' Association.

For Version 2.0, these items (1) and (2) were again reviewed. The printing quality of printing inks required differs according to purpose of use. For this reason, various types of printing inks ranging over 100,000 items now have been manufactured to suit diverse needs. The Negative List regulations were prescribed for printing inks for food packages that require safety. On the other hand, since the substances taken up here should ideally not be used in the work environment during the manufacture of printing inks, it was decided that these printing inks should not be used. Consequently, Items (1) and (2) were included as provisions of this Certification Criteria.

For Item (3), VOC problems were resolved for UV-curable inks, but the toxicity of monomers was pointed out. One characteristic of UV-curable ink is that it uses acrylic ester mainly for its composition. The main toxicity that has been pointed out is its skin irritation characteristic, which can occur simply by contact with the skin

prior to UV-curing. In terms of safety, it is ideal to use monomers with low skin primary irritation (PII) in the Draize Method Test. In the review stage of Version 2, it was concluded that inclusion of Item (3) as a provision of this Certification Criteria involved considerable difficulty, due to the absence of clear standard values guaranteeing safety and because effects according to individual metabolism, it was decided that the inclusion of this item (3) as a provision of this Certification Criteria would be difficult. However, proper handling in the work stage such as prevention of direct handling by hand as much as possible was considered important, and it was decided that handling precautions and protection methods should be indicated in MSDS, pamphlets, and instruction manual. Consequently, this item (3) was included as a provision of this Certification Criteria.

Items (4) to (6) were omitted because they have already been reviewed in Item B-5.

B-9 Other environmental impacts

The following points were reviewed under this item:

(1) Compliance to environment laws and regulations

This item (1) was omitted because it has already been reviewed in Item B-7.

C. Distribution Stage

C-1 Resource consumption and C-5 Discharge of air pollutants

The following points were reviewed under this item:

(1) Implementation of environment measures on freight trucks and enhancement of transportation efficiency by giving consideration to container type used

This item (1) was reviewed in Version 2.0. Returnable refillable containers are available for printing inks, so the efforts specified are being undertaken. However, the actual conditions cannot be monitored because these efforts are undertaken individually between users and manufacturers. Some returnable containers may on the contrary require more energy for transportation than one-way containers if the transportation distance is too long. In addition, this transportation energy is influenced by such conditions as measures to make size compact and load capacity appropriate, leading to difficulty in quantitative evaluation. Consequently, this item (1) was not included as a provision of this Certification Criteria.

C-7 Discharge/disposal of wastes

The following points were reviewed under this item:

(1) Efforts shall be made in recycling of packaging material.

This item (1) was omitted because it has already been reviewed in Item C-1.

D. Use / Consumption Stage

D-1 Resource consumption

The following points were reviewed under this item:

- (1) Reduction of energy used in printing process
- (2) No drop in work efficiency (set, drying ability, etc.)
- (3) Relation between drying energy and drying method

For Items (1) to (3), the energy used in the printing stage was studied during the review of the first version of this Certification Criteria (Version 1.0) established in 1997. It has been reported that aromatic-free petroleum inks can be dried at lower temperatures than conventional printing inks, however, because the energy used for drying printed matter differs according to paper quality and printed matter, eventually no figures were set down for this item. Taking that the energy used in the printing process does not increase, including vegetable oil based inks, Items (1) to (3) were included as provisions of this Certification Criteria.

In the review for Version 2.0, there were comments that the energy used for drying should be quantitatively evaluated upon setting numerical standards considering that this energy increases when the solvents in the printing ink are reduced. This however proved difficult because the energy used for drying is influenced by test conditions such as temperature and airflow. JIS standards on methods to test the drying property of printing inks are available only for sheet-fed printing ink, disabling application for heat set inks dried by warm air. Considering that drying ability is good if equivalent to conventional products, it was decided that submission of comparison data obtained through in-house tests between conventional products and products to be examined for Eco Mark certification shall be requested. Conventional products here mean similar-type products, and mean printing inks (for example for gravure ink, comparison shall be with general solvent based gravure ink other than the printing ink to be examined).

It was decided that Item (2) shall be verified in Criteria 4-3.(21) on quality.

D-2 Discharge of greenhouse gases

The following points were reviewed under this item:

- (1) Reduction of energy used in printing process
- (2) Energy used in manufacturing of printing ink and printing process shall not increase considerably.
- (3) Relation between drying energy and drying method

This item (1) was omitted because it has already been reviewed in Item D-1.

D-5 Discharge of air pollutants

The following points were reviewed under this item:

- (1) No petroleum solvent contained, low content of petroleum solvent
- (2) Efforts shall be made to reduce quality of printing ink solvent components in the air.
- (3) Relation between recovery method of aromatic components and quality discharged
- (4) No discharge of (offset printing ink) volatile organic solvents
- (5) No discharge of (solvent-based gravure ink) aromatic hydrocarbons
- (6) No discharge of (water-based gravure ink) organic solvents

Item (1) was omitted because it has already been reviewed in Item B-5.

Items (2) to (6) were reviewed in Version 2.0, and they were not included as provisions of this Certification Criteria due to problems of the facilities and work process of the printing manufacturers.

D-6 Discharge of water pollutants

The following points were reviewed under this item:

- (1) No discharge of water pollutants during printing

In establishing this Certification Criteria, water pollutants related to the cleaning of machines after using printing ink were reviewed, and it was decided that Item (1) need not be included as a provision of this Certification Criteria.

D-7 Discharge/disposal of wastes

The following points were reviewed under this item:

- (1) Efforts shall be made in the reduction and recycling of wastes generated during printing.
- (2) No discharge of hazardous chemical substances and hazardous heavy metals, etc.
- (3) No increase in generation and discharge of wastes

Items (1) and (2) were omitted because they have already been reviewed in Item B-8.

Item (3) was reviewed in Version 2.0. Assuming that wastes are generated during the printing process, since this item is related to productivity in the use of printing inks, it was not included as a provision of this Certification Criteria.

D-8 Use/discharge of hazardous materials

The following points were reviewed under this item:

- (1) No use and generation of hazardous substances
- (2) No content of hazardous chemical substances and hazardous heavy metals in product

This item (1) was omitted because it has already been reviewed in Item B-8.

D-9 Other environmental impacts

The following points were reviewed under this item:

- (1) (Offset printing ink) No increase in rate of isopropyl alcohol in moisture

In the review for Version 2.0, there were comments that in the event moisture must be used in the printing process, if the amount of moisture varies by printing ink, this item (1) should be included as a provision of this Certification Criteria. However, because the amount is minute, it was decided that it does not need to be included.

E. Disposal Stage

E-5 Discharge of air pollutants

The following points were reviewed under this item:

- (1) Amount of carbon and hydrocarbon gas generated during burning for disposal shall be low.
- (2) Careful selection of binder resin for burning and disposal
- (3) Reduction of environment load shall be considered for burning.
- (4) Components discharged in burning for disposal
- (5) No hazardous gas shall be generated in burning.

In the review of the first version of this Certification Criteria (Version 1.0) established in 1997, it was decided that Item (1) did not need to be included as provisions of the Certification Criteria.

In the review for Version 2.0, there were comments that for Items (2) to (5), it is important that no hazardous chemical substances and hazardous metals are added to the printing ink. Reports including that of the National Institute for Environmental Studies indicate experiment results that show that the amount of dioxin generated is proportionate to chlorine. It was therefore decided that binder resins containing halogen elements such as chlorine will not be used for printing ink. In addition, inks in the special gravure inks category were excluded, since resins containing halogen elements must be used for adhesion purpose and cannot

be substituted. Items (1) to (5) were included as provisions of this Certification Criteria.

E-7 Discharge/disposal of wastes

The following points were reviewed under this item:

- (1) Binder resin shall be selected carefully considering burning and disposal.
- (2) No generation of hazardous chemical substances and hazardous heavy metals

Item (1) was omitted because it has already been reviewed in Item E-5.

Item (2) was omitted because it has already been reviewed in Item B-8.

E-8 Use/discharge of hazardous materials

The following points were reviewed under this item:

- (1) Binder resin shall be selected carefully considering burning and disposal.
- (2) No hazardous chemical substances and hazardous heavy metals shall be contained in product

Item (1) was omitted because it has already been reviewed in Item E-5.

Item (2) was omitted because it has already been reviewed in Item B-8.

E-9 Other environmental impacts

The following points were reviewed under this item:

- (1) Binder resin shall be selected carefully considering burning and disposal.
- (2) No generation of hazardous chemical substances and hazardous heavy metals, etc. after landfill

Item (1) was omitted because it has already been reviewed in Item E-5.

Item (2) was omitted because it has already been reviewed in Item B-8.

F. Recycling Stage

F-7 Discharge/disposal of wastes

The following points were reviewed under this item:

- (1) Recycling of printer matter shall be easy.

This item was omitted because it has already been reviewed in Item F-9.

F-8 Use/discharge of hazardous materials

The following points were reviewed under this item:

- (1) No hazardous substances shall be used nor discharged in recycling.

(2) No hazardous chemical substances and hazardous heavy metals shall be contained.

Item (1) was reviewed in Version 2.0, and it was decided that this item shall not be included as a provision of this Certification Criteria because it is the process of the paper manufacturer.

Item (2) was omitted because it has already been reviewed in Item B-8.

F-9 Other environmental impacts

The following points were reviewed under this item:

- (1) No increase in environmental load during recycling of printed matter
- (2) Enhancement of deinking characteristic during recycling
- (3) No discharge of hazardous chemical substances and hazardous heavy metals, etc.

In the review of the first version of this Certification Criteria (Version 1.0) established in 1997, ways of reducing environmental load over the whole life cycle were considered, and the policy that current printing inks should not be difficult to de-ink during the recycling of printed matter was taken into account. As a result, Items (1) and (2) were included as provisions of this Certification Criteria.

In the review for Version 2.0, deinking during recycling was once again discussed, and it was verified that these items (1) and (2) should be included as provisions of this Certification Criteria. Deinking measures are being promoted by paper manufacturers. There were comments that use of UV-ink, gold, silver, and pearl inks (except Eco Mark certified inks), considered factors interfering with the recycling of used paper in Eco Mark Product Category No.120 "Paper Printed Matter," should be approved for reasons such as: deinking is only slightly related to the performance of printing ink, and there are already test data indicating that the deinking properties are satisfactory. However, no positive findings that UV inks, etc. will not interfere with the recycling of used paper exist, and because the results of deinking tests depend on the facilities of the paper manufacturers for efficiently removing the ink, it was decided that revision of this Product Category will be reviewed as necessary, including whether to include testing methods for quantitatively evaluating deinking in this Eco Mark Certification Criteria when these methods have been developed. In addition, because UV ink is a printing ink with very little VOC components, it is considered better than other printing inks for preventing air pollution. Also developed are printing inks with two drying mechanisms-radical polymerization by UV irradiation and oxidative polymerization by oxygen in the air, whose deinking characteristics are even comparable to oil-based inks. It was decided here that UV inks designed with consideration to deinking characteristic should be included for Eco Mark. However in the review for Version2.0, findings on actual UV inks designed giving consideration to deinking were inadequate, and it was difficult to specify the scope of certification. It was therefore decided that this working group will cover such

offset lithographic printing inks with the two drying mechanisms whose deinking and production characteristics have been verified. Other printing inks that may have the same deinking characteristics through technical innovation should be included for Eco Mark, taking into account the applicability of certification criteria to these printing inks. Note that Version 2.0 required that two or more test results should support the equal-to or greater-than-oil-ink deinking performance of these inks for Eco Mark certification, based on comments given after announcing the draft criteria. Printed matter is disposed of as used paper when its function(s) have been completed. Since the required deinking characteristics of printing inks differ by particulars of used paper, there were comments that Items (2) and (3) should not be applied depending on the purpose of use of the printing ink to be examined. However, as limiting the scope is difficult, the original plan was followed.

Item (3) was omitted because it has already been reviewed in Item B-8.

4-3. Quality Criteria

In the review of the first version of this Certification Criteria (Version 1.0) established in 1997, there existed no JIS standards ink, International Organization for Standardization (ISO) standards, or independent standards for printing in the industry. The only standard considered available was the ISO "Process Ink Color and Transparency Standard (ISO/2846-1 to -4)," which was being established. Considering familiar standards including JIS, this is the only quality standard available. However, for quality, submissions of test certificates and self-declaration that quality control is being implemented adequately were included as the requirements.

In the review for Version 2.0, the JIS standard for printing ink prescribed is JIS K5701-1 (test methods for flow property, tackiness, fitness of grind, drying property), but the scope of application is limited to inks used for planography and letterpress. Since the performance required according to the printing ink differs, individual test data certifying quality shall be submitted. For items designated with measuring methods in JIS, these methods shall be used. Presently, ISO standards available are limited to magnetic ink character, process ink color and transparency.