Provisional Translation

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Assessment Guidelines for the Eco-Design of Tablet Devices ver. 1

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Japan Electronics and Information Technology Industries Association (JEITA)

Provisional Translation

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Introduction

In recent years, the needs of environmental conservation and reduction of environmental load have been highlighted in order to achieve "sustainable development" of human beings. In this light, efficient use of resources and energy as well as proper disposal of wastes have become key challenges for manufactures.

Specifically, manufactures were not only required to make their business sites environmental friendly, but also to develop end products with enhanced safety and minimal environmental impacts considering the "environmental load throughout the entire life-cycle" from material procurement, manufacture, use, to disposal of such products.

The principals of the Basic Environment Law in Japan aim the "creation of a society that ensures sustainable development with reduced environmental load." More specifically, the Basic Act on Establishing a Sound Material-Cycle Society, Japan aims to achieve a society that minimizes natural resource consumption and reduces adverse impacts to environment by reducing waste generation from products, moreover reusing, recycling and properly disposing used products. Promotion of three Rs concept, that is the abbreviation for **R**educe, **R**euse, and **R**ecycle, shall be the fundamentals for product development and technological advancement in the future. In particular, in the design and manufacture of personal computers (hereinafter referred to as "PCs"), it has been expected to develop and employ highly advanced technologies that allow the minimum loads to global environment because PCs are evolving in an accelerated speed.

Although JEITA published the Assessment Guidelines for the Eco-Design of Personal Computer Products (ver. 1.1) in January 2009, currently an updated version was introduced due to the rapid prevalence of tablet devices, which significantly differ from PCs in terms of component formation, device structures, and applicable regulations. These Guidelines aim to help manufactures to voluntary assess their tablet devices from the perspective of environmental consciousness.

These Guidelines illustrate environmental assessment items and methods necessary to deliver high-performance and safe-to-use tablet devices to the society as "environmentally conscious products," which allow for low energy consumption, resource conservation, and 3Rs after use of such products.

Japan Electronics and Information Technology Industries Association (JEITA)
CE Board
Tablet Committee
Tablet Environment Committee

1. Objectives

These Guidelines aim to help manufacturers to assess their tablet devices in order to achieve "design that allows to reduce the environmental load of their products throughout their entire life-cycle" by presenting assessment items and methods.

[Commentary]

These Guidelines provide the fundamentals for the assessment of tablet devices in a way that they have the highest technical standards at the time of development/design, by implementing measures to reduce the environmental impacts in a manner that it never disturbs technological advancement and safety measures for these products.

From the perspective of Total Quality Control (TQC), these Guidelines help manufactures to pursue product safety and reduction of environmental impacts as far as possible in the product design by predicting how their products will be handled through their lifetime (from manufacture, use to disposal) based on the concept of "the next process is our customer."

Particularly, in efforts to facilitate disassembly and recycle of used or unneeded products and parts (hereinafter referred to as "used products"), sometimes there are trade-offs between such environmentally conscious design and product safety or measures for product liability (PL). Additionally, for products that may raise some safety or sanitary concerns when being crushed, disassembled, or separated, or that contain substances having harmful effects for environment, it may be necessary to develop alternative technologies and/or to properly inform businesses disposing these products about such concerns, even if these products are safe at the component level.

2. Definitions of Terms

The terms used in these Guidelines shall have the following meaning.

1. Assessment (Preliminary evaluation of Eco-Design):
   It means an assessment implemented by a tablet device manufacturer in the product design phase with the aims to achieve energy conservation during use, to ensure ease and safety during disassembly, segregation, recycle and disposal of the used product, and to reduce the environmental impacts of the product throughout the entire life-cycle.
2. Disposal:
   It means collection, transportation, disassembly, segregation, crushing, storage, recover, recycle, and incineration, etc.

3. Reduce:
   It means efficient use of raw materials by reducing raw materials used for Products and the Like (as defined below), employing recycled materials, and diminishing the generation of discarded products through enhancing the product lifetime.
4. Recycle:
   It means the utilization of materials and/or parts that have been separated or segregated from used products during the disposal as raw materials of new products.
5. Product and the Like:
   It means a product itself and associated user manuals and accessories.
6. Conventional Product :
   It means manufactures' or competitors' existing product that provides equivalent performance and applications to the newly-designed product, and that can be used as a comparison standard for newly-designed product on their environmental impacts (e.g. electricity consumption per performance, product weight, etc.)
7. Chemical Substance with Environmental Impacts:
   It means a chemical substance used for products and the like that has potentials to impose severe impacts on human health and safety, and/or to cause air, water or soil pollution during the intermediate treatment or final disposal after use.

3. Scope

These Guidelines are applied to newly-designed tablet devices.

[Commentary]

Application of these Guidelines to prototype models or products developed for a limited number of companies is up to individual manufacturer's decision. When procuring or importing OEM products from overseas manufacturers, or developing and manufacturing products designed for Japanese market in abroad and reimporting them, it is desired that the principals of these Guidelines are reflected on these products as extensively as possible.

4. Assessment Items

These Guidelines provide example assessment items and standards needed in product design that helps not only to reduce energy consumption of products but also to promote utilization of used products as recycled materials and reuse of used parts, to reduce the waste generated from used products, and to facilitate disposal of such waste.

Referring to such examples, manufacturers shall establish appropriate assessment items and standards based on the characteristics of their products, and conduct assessments by each of the established assessment item.

[Commentary]

These Guidelines provide the fundamentals of assessment to be implemented, for each assessment item. So in actual assessment by manufacturers, it is desired to establish more specific assessment procedures considering the product characteristics, functions, performances and environmental goals of the manufacturer.

Alongside the development of the Internet, tablet devices have been increasingly used everywhere from businesses, organizations, to households, due to the reduction in size and price, as well as the advanced performance.

Therefore, the product liability that manufacturers take on reduction of energy consumption and handling of used products has been increased.

Designing products with low power consumption and enhanced ease of disassembly and recycle in the design and development phase can be effective to prevent global warming and future waste-related problems, as well as to reduce disposal cost.

4. 1 Assessment of Energy Efficiency Performance

<Assessment Items and Standards>

1. Energy efficient design

(1) Does the product meet the energy efficiency standards stipulated in regulations or non-mandatory agreements?
(2) Have components with low power consumption and power-supply unit with high efficiency been developed or employed?
(3) Has the energy consumption during operation or standby been decreased?
(4) Has the energy efficiency of power-supply unit been increased?
(5) Does the product have an energy saving mode?

2. Labelling energy efficiency performance

(1) Does the product meet the labelling requirements on energy efficiency stipulated in non-mandatory agreements?
(2) Does the label present information on energy saving mode?

《Assessment Methods》

1. Status of achievement of the energy efficiency standard of the International ENERGY STAR Program which is in effect at the time of the assessment
2. Status of achievement of energy efficiency standards of power-supply unit
3. Comparison of the status of achievement of energy efficiency standards and the energy efficiency of power supply unit, etc. between the newly developed product and the manufacturer's own conventional product(s) or an existing product(s) sold in the market.
4. Status of information provided on the product's energy consumption and efficiency on product catalogue, user manual documents, and websites, etc.

[Commentary]

1. Laws, Regulations, and Non-mandatory Agreements on Energy Efficiency

Summaries of energy efficiency standards applied to information processing devices stipulated in Japanese laws and regulations as well as internationally-operated non-mandatory agreements shall be provided.

During product assessment, the latest version of applicable laws, regulations, and non-mandatory agreements on standards shall be referred to (relevant websites' URLs are provided below).

(1) International ENERGY STAR Program

The International ENERGY STAR Program established by the United States Environmental Protection Agency (EPA) is currently implemented in seven countries and regions in the world as an international energy efficiency scheme for office equipment.

This Program establishes standards for each product category on energy consumption for the idle mode, sleep mode and the Typical Electricity Consumption (TEC energy consumption) in a way that products in the top 25% energy efficiency are certified. Successfully certified products are eligible to bear International ENERGY STAR logo.

In Japan, the Ministry of Economy, Trade and Industry (METI) has established the operating specifications for this Program and operates it. The covered products include "Computers (PCs [including tablet devices], workstations, etc.)," "Monitors," and "Imaging Equipment (Printers, Scanners, etc.)".

Operating specifications of the energy efficiency standards for each covered product are available on the website of the Energy Conservation Center, Japan (ECCJ). So the status of achievement shall be judged referring to these standards and measurement methods, which are effective at the time of implementation of the product assessment.

[Website of ECCJ providing information on the operating specification of ENERGY STAR]

(2) Energy efficiency of power-supply units

As regards to power-supply units used for information equipment, in addition to the voluntary regulations under the International ENERGY STAR Program, there are laws that set standards for the energy efficiency of external power-supply units (EPS) in the United States, State of California, and Australia, and others.

In particular, the International ENERGY STAR Program stipulates the energy efficiency at certain rated output for power-supply units (external/internal power-supply units) as the certification standards for computer products.

Products covered by the International ENERGY STAR Program and those intended to be sold overseas with external power-supply units, the status of achievement shall be judged referring to the energy efficiency standards for power-supply units, which are valid at the time of implementation of the product assessment

[Website of EPA]

http://www.energystar.gov/

[EPA's PRODUCT Website]

http://www.energystar.gov/index.cfm?fuseaction=find_a_product

[Website of the Energy Conservation Center, Japan (ECCJ) for businesses]

http://www.energystar.jp/prod/index.html

[State of California: Appliance Efficiency Regulations]

http://www.energy.ca.gov/appliances/

(3) Energy efficiency standards in environmental labelling scheme in the world

Many countries have certification standards for PC products voluntary environmental labelling schemes that include status of achievement of the International ENERGY STAR Program or standard energy consumption during idle mode, sleep mode, off, etc.

These environmental labelling schemes are implemented in conformity with the international standard ISO 14024 (Type I environmental labelling). For this purpose, JIS Q 14024 has been established in Japan.

The following is a list of URLs of major environmental labelling schemes and standards. Products that intend to bear environmental labels should evaluate the conformity with the relevant energy efficiency standards.

・European Union's Eco-label:
http://ec.europa.eu/environment/ecolabel/index_en.htm
・German Blue Angel: http://www.blauer-engel.de/en/index.php
・Nordic countries' Nordic Swan: http://www.svanen.nu/Eng/ (Swedish, English)
・Swedish TCO: http://www.tcodevelopment.com/
・Japan's Eco Mark: http://www.ecomark.jp/

[Ministry of the Environment (Japan)'s web site providing data about various environmental labels]

http://www.env.go.jp/policy/hozen/green/ecolabel/f01.html

4. 2　Assessment of the Implementation of Reduce

<Assessment Items and Standards>
1. Resource saving in products
(1) Does the product have reduced weight?
(2) Does the product employ reused or recycled materials?
(3) Has employment of plant-based (bio) plastic been examined?

2. Enhancement of the lifetime of the product
(1) Has the product's performance in repair/maintenance increased?
- Structure allowing for easy repair/maintenance
- Information for repair/maintenance businesses

(2) Has the product's durability increased?
- Use of parts with enhanced lifetime

《Assessment Methods》
1. Comparison of the weight per performance between the product and a conventional product(s)
2. Comparison of the volume (percentage) of recycled materials between the product and a conventional product(s)
3. Comparison of the time required for disassembly prior to repair/maintenance work between the product and a conventional product(s)

[Commentary]

Generally, reduction of raw materials used for a product is achieved by employing lighter materials, making product walls thinner, changing product structures, and others. Through such measures, the product size and weight are reduced as much as possible while keeping the original performance. From the perspective of resource efficiency, enhancement of product lifetime may also lead to achievement of resource-saving products. It should be noted that some products have achieved increased resource efficiency but they cannot be used as recycled materials. There is a need for products that have structures made of parts and materials that are easily available for recycle.
In recent years, bioplastic have received much attention in the light of saving exhaustible resources, which are raw materials of petroleum-based plastic. However, the environmental impacts of bioplastic have not been fully studied yet. So when employing it for products and the like, it is necessary to consider its environmental loads generated at the time of manufacture and disposal.

For specific assessment items, the following shall be considered.

1. Assessment based on the comparison of resource efficiency
- Assess the reduction in product weight by comparing the weight per performance
- Assess the increase in the percentage (by weight) of recycled material (recycled plastic etc.)

2. Assessment of enhanced product's lifetime

- Assess the product structure's ease of maintenance and repair, supplies or failed parts replacement, and tool usage. Comprehensively, assess the time necessary for disassembly prior to maintenance and repair work.
- Assess preparedness of documents describing the disassembly process and maintenance/repair methods because in order to shorten the time for disassembly, it is needed to provide such information for (educate) workers.

4. 3 Assessment of the Implementation of Recycle

<Assessment Items and Standards>

1. Selection of recyclable material and/or parts

(1) Does the product have recyclable material and/or parts?
- Kinds and weight of parts containing precious materials (made of precious or rare metals)
- Kinds and weight of commonly-used metals such as steel, copper, and aluminium
- Kinds and weight of plastic materials that are suitable for material recycle (thermoplastic)

(2) Does the product have composite materials? Or has the product received treatment that interferes with recycle?
- Reduction of composite material and parts made of different type materials (e.g. metal and plastic)
- Avoidance of metal plating, paint, and plastic coating agents made from materials different from main component

2. Structure in which disassembly and separation can be easily performed

(1) Is the product easily disassembled and separated into materials/parts to be recycled and others?
- Ease of disassembly and separation of the product into parts containing precious metals, commonly used metal parts, plastic parts intended for material recycle, glass parts, and others.
- Structure in which secondary batteries can be removed easily

(2) Does the product have a structure in which different materials can be easily separated?
- Minimization of joints using different type adhesives, welding, swage
- Avoidance of using screws embedded into plastic parts
- Creative jointing methods for plastic parts (insertion, snap joint etc.)

(3) Does the product have structure in which materials/parts that interfere with recycled parts are easily removable?
- Consideration is needed to make easy to identify separation points on the product (design, labelling, etc)

(4) Have the product's disassembly and separation methods been established? Have human working hour needs to complete this works been reduced ?
- Ease of disassembly and separation with commonly used tools
- Ease of disassembly and separation from one direction

- Disassembly from underside for heavy products shall be avoided (for ease of disassembly work by one person)

(5) Does the product have reduced number of parts and screws?

3. Ease of segregation

(1) Is it easy to identify the quality of materials/parts for workers?
- Plastic parts over 25g shall bear symbols stipulated by JIS Standard K 6899 / K 6999 or ISO 1043 / 11469
- Secondary batteries shall be labelled according to the Law for the Promotion of Effective Utilization of Resources, as the Specified Labelled Product
- Symbols and labels shall be easy to recognize (position and size)

(2) Are employed materials unified?
- The materials of frames, chassis, and etc. shall be unified to a single material and unitized.

(3) Is it easy to identify materials difficult to recycle?

《Assessment Methods》

1. Status of compliance with requirements under applicable laws and regulations including the Law for the Promotion of Effective Utilization of Resources
2. Status of conformity to guidelines and manuals developed internally or issued by industry groups and others (including JEITA)
3. In addition to the above two items, the newly-designed product shall be compared with a conventional product(s) on the following items.

(1) Employment of recyclable material/parts: the weight and number of employed recyclable materials, the recyclability, etc.

(2) The product structure's ease of disassembly and separation; the time necessary for disassembly and separation works prior to the collection of materials to be recycled

(3) The ease of segregation: the kinds of materials employed as well as the percentage of labelled parts

[Commentary]

The following is the principle for assessment towards Recycle.

1. It is necessary to select parts, materials, and structures that are intended for Recycle. Subsequently, it is needed to assess the factors that interfere with recycle.

In regard to metal materials, commonly used metal material suitable for material recycle shall be selected. In case of parts containing precious metals, the part structures shall be designed suitable for material recycle.

In regard to plastic, materials with suitability for material recycle shall be selected. Appendix－1 "Types of Plastic Materials Suitable for Material Recycle" provides guidelines for this purpose.

In product development/design phase, it is necessary to quantitatively estimate and evaluate the percentage of parts/materials that might be recyclable in the future, when the product would already be used one.

In principle, a high priority is given to Reuse and material recycle namely it is

important to utilize used products as resources. Especially, in case of plastic parts the use of coating, plating, painting, printing, labelling, metal insertion, adhesives and similar procedures shall be avoided or reduced.

2. In case of tablet devices, that are generally expected to be water resistant, it is necessary to consider casing disassembly methods in a way that recyclable parts/materials are easily separated. It is desired that the parts/components contained in such casing are disassembled and separated by mounted printed board unit, SSD, liquid crystal unit, cables, and so on.

   The Appendix－3 (Degree of Product Disassembly) represents some example standards for product disassembly. When deciding the degree to which the product is disassembled, various requirements shall be considered according to the product characteristics.

   Although it is needed to facilitate removal of secondary batteries, as it is designated as Specified Resources-Recycled Products under the Law of Promotion of Effective Utilization of Resources, Japan, many tablets have built-in secondary batteries. In order to ensure workers' safety during replacement or collection, desirably the product structure does not need cutoff of connectors and other similar cables during such works.

   It should be noted that recycle of the product's main body can be facilitated if material and/or parts that would be obstacles for recycle can easily be removed/separated.

   It is also vital to evaluate tools and working time necessary for actual product disassembly and separation works, in conjunction with the ease of such works.

3. Plastic parts, secondary batteries, etc. shall be labelled so that the parts/materials to be disassembled and separated can be easily segregated. Although laws and regulations require labelling plastic parts of tablet devices over 25g, at the same time it is desired to label every plastic part as much as physically possible.

   Identification symbols for plastic parts shall be marked according to JIS K 6899-1 (ISO 1043-1, Basic polymers and their special characteristics), JIS K 6899-2 (ISO 1043-2, Fillers and reinforcing materials), ISO 1043-3 (Plasticizers), JIS K 6899-4 (ISO 1043-4, Flame retardants), or JIS K 6999 (ISO 11469, Generic identification and marking of plastics products) as much as possible. In addition, for the sake of material recycle facilitation, labelling would desirably includes grade identification, namely detailed information about the plastic material (manufacturer of the resin, product name, lot number, etc. Please note that marking methods differ by manufacturer).

   Examples of specific markings are shown below.

Example of marking

(1) Marking for normal ABS resin according to ISO 1043:

＞ＡＢＳ＜

(2) Marking for FR ABS resin according to ISO 1043:

＞ＡＢＳ　ＦＲ (17) ＜

※Here FR stands for "flame resistant"; and
17 means Antimony compound＋aromatic bromide (＝brominated flame retardants)

(3) ISO 1043 marking including grade identification (manufacturer of the resin, product name, serial number) flame resistant ABS plastic:

＞ＡＢＳ－ＦＲ＜
ＡＢＣＤ．　Ｃｏ．　Ｌｔｄ．
ＰＯＬＹＭ，ＡＢ－560

In the “Assessment Methods”, assessment processes, including the confirmation of conformance for applicable laws and regulations and guidelines developed by relative industry and/or by each manufacturer, are clarified.. In case of individual assessment, comparison with a conventional product(s) is determined to be the basic assessment method.

4. 4　Assessment of the ease of disposal

<Assessment Items and Standards>

1. Adaptability for mechanical crushing, and treatment or recycle performed in incineration facilities
   Is it easy to separate objects that may be difficult to crush/cut-off, may damage crushers, or may damage incinerators by being melted?
   · Hard parts, soft materials, metal parts with low melting points, glass parts, and etc.

2. Safety during disposal process
(1) Does the product have a structure that allows disposal workers to handle it safely?
(2) Is it easy to separate objects to be preliminary segregated?

・Parts with possibilities to explode or catch fire
Lithium-ion battery, chassis made from magnesium, and etc.
(3) Are there clearly displayed markings that help the preliminary segregation?
(4) Is proper disposal available for the parts/units preliminary segregated?
・Confirmation of proper disposal technique

3. Disclosure about disposal
Has a manual(s) for disassembly prepared?
・Disassembly manual, service manual, user instruction, and etc.

《Assessment Methods》
1. The status of compliance with requirements under laws and regulations including the Waste Management and Public Cleansing Law
2. Status of achievement of guidelines established by JIS or relevant industry
3. Status of achievement of manuals and guidelines established by the manufacturers
4. Assessment shall be implemented on the following items in addition to the above 1 to 3.
(1) In regard to facilitation of crushing of products and the like, it shall be compared with a conventional product(s) on the existence of units that are difficult to crush/cut-off, and if any, the number and volume of such units, working time needed to separate them, and concerns about damage to disposal facilities
(2) In regard to securement of safety during disposal, the product shall be compared with the conventional product(s) on the risk (exploding or catching fire, and etc.), the number of parts, working time needed for separation, safety of workers, and concerns about damage to incinerators

[Commentary]

1. After separating parts that can be used as recycled resources, crushing and incineration shall be performed with the aim of reducing the remaining materials' weight, detoxifying them, and recovering energy from them. Therefore, facilitation of crushing and incineration and maintenance of treatment facilities shall also be considered. Hard-to-crush materials (e.g. materials that may damage the crusher) include hard parts (motors, FRP parts, etc.), soft materials (gum, sponge, etc.), and glass parts.

2. Avoidance of parts with such risks shall be considered first, in order to secure the safety during disposal.

In the matter of products parts where risk(s) of explosion and/or catching fire, etc. might be possible, the product structures/configurations shall allowing such parts to be easily separated, in order to facilitate the preliminary segregation.

In addition, it is desired that such products have structures that are safe for workers, furthermore that information is provided for treatment businesses so that they could take safety measures by themselves such as prevention of overturning or preparation of containers for these products.

3. Provision of information about hard-to-treat objects, preparation of disassemble manual, and display of contact details shall be provided .

4. 5 Assessment of the environmental protection performance

<Assessment Items and Standards>
1. Selection of safe material/parts
(1) Have those chemical substances been avoided that may affect human health and safety?
- Chemical substances regulated by laws and regulations
- Chemical substances regulated by voluntary regulations

(2) Has the use of ozone depleting substance been avoided?
- Chemical substances regulated by laws and regulations
- Chemical substances regulated by voluntary regulations

(3) Does the product give utmost consideration to the highest safety in terms of parts containing chemical substances with environmental impacts? (e.g. employment of alternative parts that have equivalent functions)

2. Reducing the use of chemical substances with environmental impacts and similar substances in the manufacturing process
(1) Do product specifications aim to reduce chemical substances with environmental impacts and other similar substances during the manufacturing process?
- Ozone depleting substance
- Chemical substances regulated by laws and regulations on the environment
- Substances regulated by laws and regulations on occupational safety and health

(2) Do product specifications aim to reduce chemical substances with environmental impacts and other similar substances contained in gases, effluents and wastes emitted during the manufacturing process?

3. Avoiding the generation of chemical substances with environmental impacts during use
Has the product been given a careful consideration to volatile organic compound?

4. Recycle / proper disposal of parts containing chemical substances with environmental impacts
(1) Have the collection method and recycling pass been established?
- Secondary batteries, etc.

(2) Is it easy to separate parts containing chemical substances with environmental impacts?
- Secondary batteries, etc.

(3) Has the use of chemical substances with concerns of generating harmful substances during disposal (e.g. incineration), such as dioxin, been avoided?

《Assessment Methods》
The use of chemical substances with environmental impacts shall be confirmed

by reviewing the Material Safety Data Sheet (MSDS) or related documentations of the intended product, referring to applicable laws and regulations as well as internal standards.

[Commentary]

As a principal, assessment standards for environmental protection performance shall include 1) that the use of chemical substances that may significantly affect human health and safety has been avoided; and 2) that the use of chemical substances with environmental impacts has been avoided in the light of treatment and final disposal of used products.

For details of relevant laws, regulations and non-mandatory agreements, the websites mentioned below should be visited.

1. It is recommended to establish internal standards for usage of chemical substances with environmental impacts referring to domestic and international environmental laws and regulations, as well as voluntary regulations (e.g. environmental labelling programs); and to check the use of chemical substances with environmental impacts accordingly.

In addition, it would be desired to check laws and regulations that regulate chemical substances with environmental impacts including air, water and soil polluting substances, and ozone depleting substance.

＜Example＞

- Air Pollution Control Act
- Water Pollution Control Act
- Agricultural Land Soil Pollution Prevention Law
- Waste Disposal and Public Cleansing Law
- Law for the Promotion of Utilization of Recycled Resources
- Poisonous and Deleterious Substances Control Law
- Act on the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures
- Offensive Odour Control Law
- Law for the Control of Household Products Containing Harmful Substances,
- Water Works Act
- Sewerage Law
- Pollutant Release and Transfer Register Law

In addition to the above, in order to check the safety of chemical substances used for parts/units comprising the product, information about substances with hazards and

risks described in the Guidelines for Management of Chemical Substances Contained in Products (published by the Joint Article Management Promotion-consortium (JAMP) and the domestic VT62474) as well as IEC62474 and corresponding standards shall be referred to.

[Domestic VT62474]: http://www.vt62474.jp/

2. Laws and regulations that regulate chemical substances (e.g. Air Pollution Control Act) cover substances that may be used in manufacturing processes. It shall be confirmed in the product design phase that chemical substances with environmental impacts used in the manufacturing processes is reduced.

3. Assessment of volatile organic compounds (VOC) emitted during use shall be implemented.
[Website about the VOC Emission Rate Specification for Personal Computers and Tablet Devices (ver.1)]
http://home.jeita.or.jp/cgi-bin/page/detail.cgi?n=47&ca=14

4. In regard to parts containing chemical substances with environmental impacts, reduction of usage and facilitation of separation of shall be confirmed.

4. 6 Assessment of the packaging materials and user manuals

<Assessment Items and Standards>
1. Assessment of the Reduce
(1) Does the product have reduced packaging materials?
· Reduction of weight and volume
(2) Does the product employ recycled materials?
· Recycled paper, pulp-mold, recycled plastic
(3) User manuals etc.
· Reduction of weight and volume

2. Assessment of the Recycle
(1) Does the product employ recycled materials?
Cardboard, pulp-mold, non-wood fiber, styrene form, etc.
(2) Is it easy to separate the recyclable materials from substances that interfere with Recycle?
· Separation of cardboards from other materials
Sealing tape, styrene form, urethane foam, staples, etc.
· Separation of styrene form other materials
Vinyl tape, paper label, and etc.
(3) Do plastic materials have identification code?
· Material marking in accordance with the Law for the Promotion of Effective Utilization of Resources and JIS standard
(4) Is it easy to collect and transport the product?

· Reduction of bulk and weight (e.g. foldable design)

3. Environmental protection performance during treatment and final disposal
(1) Has the use of chemical substances with environmental impacts been avoided or reduced?
· Heavy metals containing pigments of printing ink etc.
(2) Has the use of substances with concerns of generating dioxin and other similar substances during incineration been avoided?
· Vinyl chloride sheet or films etc.

《Assessment Methods》
The assessment method for packaging materials and user manuals shall be determined pursuant to the product's Assessment method.

[Commentary]

Assessment items and methods for packaging materials and user manuals shall be established in a similar approach that was used for the product assessment.

1. Recycle: Quantitative comparison of the percentage of recycled materials with conventional product(s)
2. Reduction of weight and volume:
   Comparison of weight percentage [packaging material weight ÷ product weight ×100]
   Comparison of volume percentage [(total volume − packaging material volume) ÷ total product volume ×100]
   (The above product weight and product volume also include the bundled items such as user manuals.)
3. Ease of disassembly and segregation: Working time for and ease of disassembly (e.g. avoidance of adhering different kinds of materials)
4. Display performance (Note 1): Ease of segregation based on plastic identification symbols, material identification markings and labelling
5. Regulated hazardous substances: Review the compliance to the regulatory standards under applicable laws and regulations
6. Recognition of packaging material quality and weight by type of material

(Containers and Packaging Recycling Law, April 2000)

Note 1: For plastic symbols, material identification and labelling, the latest versions of JIS K 6899-1 (ISO 1043-1) and JIS K 6999 (ISO 11469) shall be confirmed.

＜Examples of identification marking＞

(1) Polystyrene resin (when displayed in a place away from the identification mark):

＞ＰＳ＜

(2) Paper (when displayed under the identification mark):

外箱

(3) Polyethylene resin (when displayed under the identification mark):

ＰＥ

4. 7　Assessment of the information provision

<Assessment Items and Standards>

1. Assessment on method of information provision for product handlers

(1) Is information provided in an appropriate manner for those who are engaged in selling and maintenance of the product?

(2) Is information provided in an appropriate manner for users?

2. Types and contents of information provided

(1) Is information about Reduce properly provided?

- Status of the use of recycled materials, such as recycled plastic materials

(2) Is information about energy-saving performance properly provided?

- Labelling of the Energy Saving Performance stipulated by the Energy Conservation Law (for more details, see Section 4. 1 Commentary 3 of these Guidelines.)
- Instruction on the use of energy-saving mode of the product

(3) Is information about safety during product handling and discarding procedures properly provided?

- Instruction and precautions for safe use
- Procedures and methods on maintenance and repair work
- Precautions for discard of products and the like
- The physical properties of products/parts that are extremely difficult to compress or crush; corrosive, hazardous, or explosive nature of products/parts that must be noted to properly dispose them; risks associated with disposal of the products/parts; environmental protection performance; and impacts to disposal facilities

· Possibilities of generation of toxic gas etc. resulted from heating treatment (e.g. incineration)

3. Understandability of provided information and methods to ensure that enough information is provided

(1) Is there an appropriate information display on products and the like (direct labelling or attachment of environmental labels)?

(2) Do user manuals and similar documentations provide easy-to-understand information using figures etc.?

《Assessment Methods》

1. Intended Recipients and status of provision of necessary information
2. Status of compliance with relevant laws and regulations
3. Status of compliance with domestic or industry-wide standards and guidelines
4. Status of achievement on in-house manuals and guidelines
   · Display method (font size, position), contents of description, understandability, procedure for information disclosure etc.

[Commentary]

The following is the basic principle for assessment methods and judgement criteria for information provision relating to used products, in consideration of promoting the utilization of recycled materials and parts.

1. Information provision for intended recipients (requesters)

Appropriate information shall be provided for each recipient about the increase in the product's resource efficiency, enhancement of product lifetime, reduction of wastes to be generated from the product, ease of product disposal, and securement of product safety.

The following table shows the relationship between recipient and information to be provided, as an example.

<table>
<tr><th rowspan="2">Recipient</th><th colspan="3">Example of information to be provided</th></tr>
<tr><th>Reduce
(Minimization of waste generation)</th><th>Recycle</th><th>Energy Conservation and Safety</th></tr>
<tr><td>Those who engaged in selling</td><td rowspan="5">○Simplified packaging
○Repairing system
○Storage period of parts for maintenance
○Status of use of recycled materials such as recycled plastic materials</td><td rowspan="3">○ Collection, discard, and disposal methods for used products
○Methods for Recycle used secondary batteries</td><td>○Safe use
○Precaution regarding human health during use</td></tr>
<tr><td>Those who engaged in maintenance</td><td>○Procedure of maintenance and repair</td></tr>
<tr><td>Users</td><td>○Precautions for handling
○Eco-friendly usage of the product
○Tips for energy-saving usage
○Energy Saving Performance (Energy Conservation Law, International ENERGY STAR etc.)</td></tr>
<tr><td colspan="2">○Precautions for discarding products and the like</td></tr>
<tr><td>Recycling treatment businesses</td><td rowspan="2"></td><td colspan="2">○Crushing and incinerating methods for products/parts
○Possibilities of generating toxic gas etc. resulted from heating treatment (e.g. incineration)
○Corrosive, hazardous, and explosive nature, toxicity, environmental protection performance, and impacts on disposal facilities</td></tr>
<tr><td>○ Procedure and method for part removal (disassembly)</td><td></td></tr>
</table>

2. Secure provision of information

It is desired that necessary information is displayed on the product itself. In addition, if the product cannot display enough information due to the restriction of available space, etc., necessary information shall be provided in user manuals and/or other media (e.g. Internet).

3. Establishment of information providing mechanism

An information provision system shall be established within the company in coordination with relevant organizations, so that user manuals and similar

documentations shows exact contacts where users' inquiries about contents of the user manuals can be sent (including contacts of the relevant organizations).

4. Continuous improvement

Though the abovementioned points from 1 to 3 should be principal assessment standards and judgement criteria, continuous improvement on these terms is the utmost important.

To this end, the following two measures should be effective.

(1) Promotion of standardized design

There shall be a continuous improvement in terms of information that is displayed on the item, the display method and the operation of such information provision system. In order to secure such improvement, reviewing systems shall be established through internal standards or other related regulations.

(2) Proactive utilization of various laws, regulations, and guidelines

There are several laws that stipulate the content of information to be provided along with appropriate methods, as well as the obligation of documentation (e.g. Law for the Promotion of Effective Utilization of Resources, Energy Conservation Law, Waste Management and Public Cleansing Law, and Containers and Packaging Recycling Law).

Additionally, the Japanese government and industrial organizations provide information through circulars and publications including the document titled "Towards the Achievement of the Most Resource-Saving Society in the World" (January 2008) published by the Waste and Recycling Subcommittee under the Environment Committee, Industrial Structure Council, METI. Such information shall be proactively utilized by acquiring such notices and publications from time to time.

4. 8　Assessment based on LCA (Assessment of environmental impacts)

<Assessment Items and Standards>
1. Environmental Impact Assessment in each phase of product life cycle
Have environmental impacts generated in each stage of the product's life cycle from raw material manufacturing, product manufacturing, logistics, use, to discard/recycle been reduced?
- Raw material manufacturing: Environmental impacts generated from the extraction of resources to manufacture of raw materials
- Product manufacturing: Environmental impacts generated from the manufacturing of parts to processing, assembly, and manufacture of products
- Logistics: The environmental impacts generated during product transfer from manufacturing site to users
- Use: Environmental impacts during use
- Discard/recycle: Environmental impacts associated with discard/recycle of the product

《Assessment Methods》
(1) Assessment shall be implemented according to LCA program developed internally or by third party institutes
(2) The assessment items are:
・Impacts on global warming (CO_2 equivalent)
・Impacts on acidification (SO_2 equivalent)
・Energy consumption
The product shall be quantitatively assessed according to the above criteria.
(3) The environmental impacts generated in each stage shall be compared to previously and newly developed products in order to verify the improvements.

[Commentary]

LCA (Life Cycle Assessment) quantitatively analyses the environmental impacts generated in each stage of the product life cycle, from raw material manufacturing, product manufacturing, logistics, use, to discard/recycle. Thus, environmental impacts can be assessed when LCA is implemented in the product design stage.

In addition, if in-house LCA program is used, preconditions for each stage and data collection period and method shall be in accordance with the program.

The range and depth of study for LCA are determined according to the purpose of the assessment. When products are manufactured abroad, the accuracy of collected data about manufacturing should be reviewed precisely. It should also be noted that there are differences in the basic unit between Japan and overseas countries.

The EcoLeaf Environmental Label operated by the Japan Environmental Management Association for Industry is an example of quantitative environmental information program based on LCA.

4. 9 Overall Assessment

Desirably an overall assessment should desirably be implemented, based on the results of individual assessment items.

The overall assessment can include aggregation of the result of each assessment item and comparison of the intended product with alternative design(s). In such assessment processes, weighting shall be performed since the importance of individual assessment item varies due to the product characteristics.

When conducting an overall assessment, it shall be noted that in some cases there are trade-offs between individual assessment items.

If the result of the overall assessment is worse than the conventional product'(s), re-design of the product and examination of measures for improvement should be conducted.

Certainly, the overall assessment shall take into account the minimum requirements of the product (e.g. original functions shall not be lost, product safety during use shall be secured).

[Commentary]

Overall assessment comprehensively determines whether the product needs any measures for improvement (in material, structure, or labelling etc.) or not, by aggregating the results of individual assessments.

1. When the importance of individual assessment item varies due to the product characteristics or internal environmental impact assessment standards, such individual assessment items shall undergo an adequate weighting.

   The coefficients of such weighting are preferably determined through an appropriate subjective evaluation.

2. In general, it is difficult to perform subjective and absolute assessments on only one design plan, so in overall assessment, comparison with alternative plans shall be conducted.

3. It should be noted that in some cases, there are trade-offs among individual assessment items, in which efforts to get higher score in an item lead to lower score(s) in other assessment item(s).

4. Typically, numerical rating systems are employed but there are no definitive approaches for overall assessments. It is desired that an appropriate methodology is employed based on the product characteristics.

5. In addition, the overall assessment shall pay significant attention not to interfere with the minimum requirements as a product (e.g. the original functions shall not be

lost, the product safety during use shall be secured).

The following are examples of overall assessment, by total score approach and radar chart approach.

【Reference】 Samples of overall assessment methodologies

(a) Total Score Approach

This approach evaluates the product by scoring the product performance on each item (e.g. based on comparison with a conventional product) and totaling the scores.

(Example)

Assessment item	Assessment method	Weighting Coefficiency (Note1)	Conventional product			Newly-designed product		
			Rating	Score (Note 2)	Weighted Score (Note 3)	Rating	Score (Note 2)	Weighted Score (Note 3)
Energy Conservation	Comparison with a conventional product on energy consumption and energy efficiency	2	-10%	+1	+2	-20%	+2	+4
Reduce .	Comparisons with a conventional product on weight (including paper resource)	2	±0%	0	0	-10%	+1	+2
Reuse .	Comparison with a conventional product on employment of recyclable parts	4	±0%	0	0	+10%	+1	+4
Recycle	Comparison with a conventional product on the number of kinds of used materials (including the number of colours), the percentage of recycled materials, and the percentage of recyclable materials	4	-5%	+1	+4	-20%	+2	+8
Total score					6			18

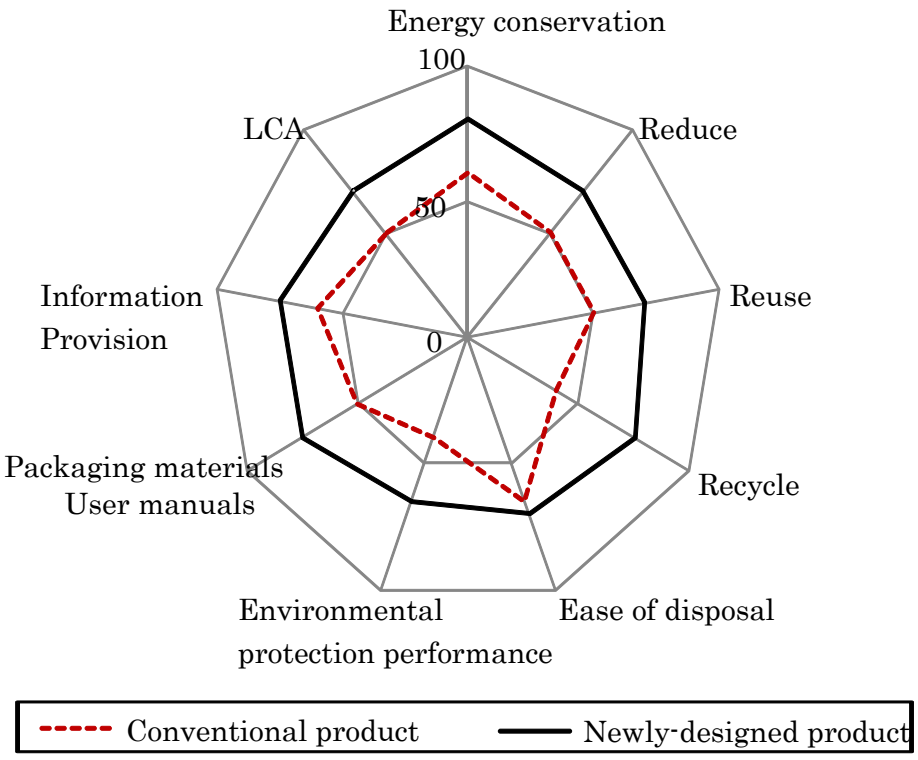
(Note 1) These coefficients shall be used when the importance of individual assessment item differs from each other
If the assessment items do not undergo weighting, all values shall be 1.

(Note 2) Each item shall be scored as following based on the comparison with a conventional product:
+2: Significant outcome, +1: Reasonable outcome, 0: As it was,
—1: Worse than previous

(Note 3) Weighted score ＝ Score × Weighting coefficients

(b) Radar chart approach

This approach evaluates the product by making a radar chart using the scores on each assessment item. It focuses on the existence of items with significantly low score and the score of items with particular importance among others.



5. Procedure for assessment of eco-design

5. 1 Preparation of an assessment manual

Manufacturers shall appropriately develop their own eco-design assessment manuals considering their own organization, structure, and the characteristics of products to be covered, taking into account their goals of eco-design and these guidelines.

[Commentary]

Basically, an assessment manual shall indicate the objective and scope of assessment, definitions of terms, assessment procedures that are described in Sections 4 and 5 of these Guidelines, individual assessment items and overall assessment.

5. 2 Assessment procedures

In order to achieve fruitful assessment and to secure the subjectivity, the assessment should preferably be implemented in two phases. Firstly self-assessment should be conducted by persons/departments that developed/designed the product (hereinafter referred to as "product designers"), secondly subjective assessment could be performed by assessor who are in charge of assessment, based on the aggregated results of the self-assessment (hereinafter referred to as "Subjective assessors").

[Commentary]

Although the assessment may be conducted in conjunction with other assessments run in the design phase (e.g. assessments of function, cost, safety, and etc.), the subjectivity of the assessment shall be secured. Assessment methodologies may include: (a) a method that judges if the product meets each of individual assessment items that have been properly set according to the product characteristics, and (b) a method that scores the product on individual assessment items compared to environmental targets (targets for improvement) that have been properly set according to the product characteristics. In any case, assessment should be implemented according to proper criteria. The following is an example of assessment flow for reference.

(1) Self-assessment

It can be an idea to implement individual assessments on multiple design plans to determine the best one, which earns the best rating.

When some product improving measures are implemented according to the results

of overall assessment, the processes of individual assessment and subsequent overall assessment shall be conducted again.

The product designers shall record the results of the individual and overall assessments and accordingly-implemented measures, and then compile them into a report, attaching the composition of chemical substances used, the product's safety data, and relevant supporting documentations.

(2) Subjective assessment

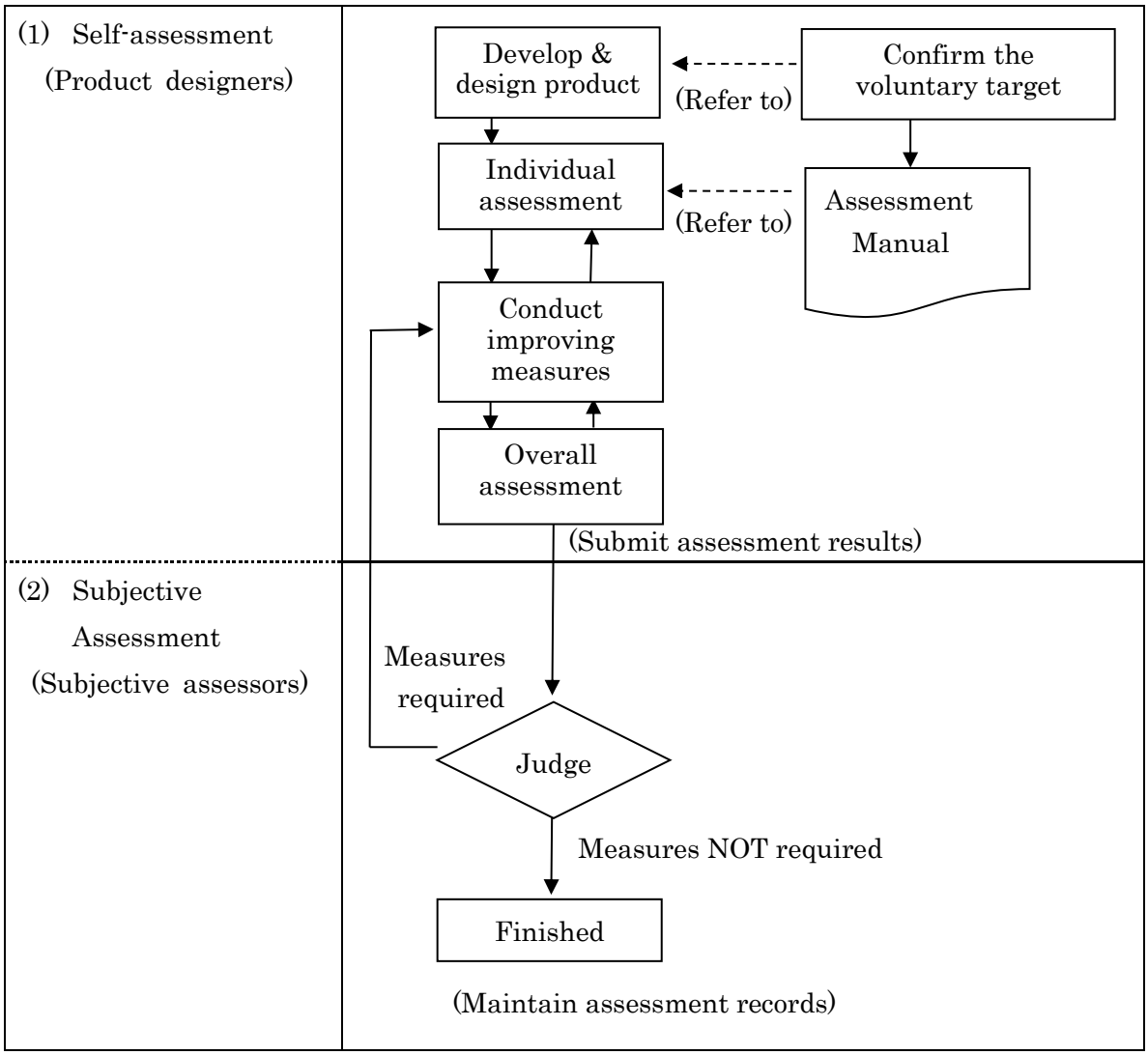
Subjective assessors shall validate the results of the self-assessment based on the self-assessment reports and the prototype product to be mass-produced, checking the existence of any failure in assessment items or any misunderstanding in assessment methods, as well as considering the latest trends in environmental regulations, environmental technologies and environment- or safety-related accidents.

When necessary, the assessors shall ask the product designers to submit the results of dissolution test on hazardous substances and/or toxicity assessment.

When the assessors conclude that some improving measures shall be taken for the product or that individual assessment items shall be revised, self-assessment shall be implemented again.

The product designers shall deal with the comments from the subjective assessors and shall record the measures taken.

＜Example of assessment flow＞



5. 3 Cooperation with materials/parts suppliers

Manufacturers should mutually cooperate with suppliers that design/develop units and parts of their products, to make products essentially safe and energy-efficient, to enhance the product lifetime by increase product's functions, and to achieve product structure where recycle of the products can be easily conducted. These should be in accordance with these Guidelines.

In addition, it is desired to promote coordination and cooperation among the entities belonging to their supply chains in order to reduce by-products such as wastes generated during manufacturing of pars and final products.

[Commentary]

Cooperation may include:

(1) Provision of necessary information such as individual assessment items and standards from manufacturers to suppliers of materials/parts
(2) Implementation of necessary assessments on the materials/parts by suppliers of materials/parts
(3) Display the material quality by suppliers of materials/parts, which are necessary for the easy segregation of the parts to be recycled
(4) Provision of necessary information such as material quality and structure of the parts from suppliers of materials/parts to the manufacturers
(5) Provision of necessary information regarding recycle of used materials/parts, as well as disposal methods for such used materials/parts that are safe and do not impose impacts to environment
(6) Coordination between suppliers of materials/parts and manufacturers to reduce by-products such as wastes generated during manufacture.

On the subject of tablet devices, information about recyclability of units/parts, efforts that were made to make disposal easier for users, and environmental performance and safety of the products shall be provided for consumers because used tablet devices are generated in wide-ranging places including general households.

In particular, to ensure the safety during disposal of discarded products and to prevent associated environmental pollution, it is needed for manufacturers to cooperate with suppliers of materials/parts by providing information about proper disposal of hazardous chemical substances contained parts/materials. Manufacturers can get information about hazards by requesting suppliers to submit MSDSs (Material Safety Data Sheets) of parts/units used for the product, which contain information about chemical substances with environmental impacts and/or hazards.

On the other hand, the document titled "Towards the Achievement of the Most Resource-Saving Society in the World" (January 2008), which was published by the Waste and Recycling Subcommittee, Environment Committee, Industrial Structure Council, reported that the following two findings can be measures for re-strengthening the Reduce among companies comprising a supply-chain.

[1] There are certain challenges where manufacturers' design and specifications may restrict the flexibility of the suppliers of materials/parts in reduction of the by-products, namely the strict quality requirements may result in decreased yield rate.
[2] Reduction of by-products can lead to minimization of input raw materials and result in reduced cost and increased competitiveness. It may even be an effective method for suppression of energy consumption during the manufacturing processes. It is thus essential to look at initiatives implemented for cooperation among businesses belonging to the supply chain.

In addition, the reduction of waste and recycle of used products cannot be promoted

without close mutual cooperation between the manufacturers and suppliers from the perspectives of avoidance of composite materials, reduction of types and number of screws used for the product, unification (utilization of a single material) of plastic materials, cost of use of recycled materials, and product quality.

Appendix-1 Types of Plastic Materials Suitable For Material Recycle

For plastic, the material recycle is literally the approach of recycle, in which plastic is recycled as material; chemical recycle is an approach in which the plastic is decomposed to be used as chemical material or fuel; and thermal recycle is an approach in which plastic is burnt to recover the thermal energy. In product design, a priority shall be given to parts' Reuse and Recycle as raw material. This Appendix lists the plastic materials suitable for material recycle. In order to be suitable for material recycle, plastic materials should preferably have good scores on the following quality assessment criteria.

Table Assessment of recyclability of plastic materials

No	Assessment items	Details of item	Recycled material					
			PP	PS	PE	PC	ABS	AS
1	Lifetime	Lower deterioration resistance during operation	○	○	○	○	○	○
2	Regulations	Domestic and international voluntary regulations regarding Recycle	◎	◎	◎	◎	◎	◎
3	Appearance	Excellence in surface gloss after shaping, colorability, ease of second processing (bonding, paint etc.)	△	○	△	○	◎	○
4	Ease of shaping	Versatility in forming (thin/thick-wall, rib, etc.)	○	◎	○	△	◎	◎
5	Versatility	General purpose resin (physical properties that allow for unification of materials)	○	○	△	○	○	○
6	Ease of assembly/disassembly	Excellence in performance in hinge mechanism / fitness of snaps	◎	△	○	○	○	△
7	Ease of recycle	Good resistance against cleanser, less degradation after heating, melting, kneading, and shearing, and high compatibility that allows for easy mixed-recycle with other materials	◎	◎	◎	○	○	○
8	Ease of volume reduction and crushing	Volume reduction and crushing after collection are easy	○	○	○	○	○	○

※This table shows the rating of general grade product (◎: Good ○: Moderate △: Slightly Poor)

Resource: Ryoichi Yamamoto, 1995. Eco-material revolution that saves the Earth: Tokuma Shoten

Plastic materials that are suitable for material recycle cannot be determined by a single fixed approach because they cover a wide-range (e.g. thermoplastic or thermosetting), and the recycle technologies are emerging and associated costs vary with time. The followings are those suitable for material recycle, determined based on the current recycle technology and industry.

Plastics materials that are suitable for material recycle	As thermoplastic and general-purpose resin PP, PS, PE, PC, ABS, AS

Note 1: Products with secondary processing (e.g. paint, plating, insertion, different parts bonded) are not suitable because foreign substances may be mixed.

Note 2: For composite materials, filler composite materials are relatively suitable for recycle, but resin with glass/metal fiber as filler is not suitable because its physical properties significantly decrease after recycle.

Appendix-2 Range of Recyclability

1. Recyclability

In principal, what is important in the development/design phase is the improvement in recyclability, giving a high priority to Reuse and material recycle.

The recyclability is an index that quantitatively and preliminarily estimates and evaluates in the product development/design phase the weight percentage of parts/materials (per total weight of the product) that will be identified to be recyclable at the time the product become used.

The recyclability is determined by established recycle technologies and the manufacturer's efforts on recycle.

It is recommended to calculate the recyclability using the existing calculation conditions for Resource Recycling Rate that have been set by relevant industry or by each company, or actual recycling rate based on the actual results.

2. Calculation method of recyclability

Recyclability is a ratio of the total weight of recyclable materials to the total weight of the product. It is calculated from the following formula.

$$\text{Recyclability (\%)} = \frac{\text{Total weight of recyclable materials}}{\text{Total product weight}} \times 100$$

《Descriptions of terms》

○Total weight of recyclable materials: total weight of parts and materials that fall under the following (1) or (2) within one product.

After disassembling a used product:
(1) Objects that are available for material recycle, in which such objects are separated, segregated, crushed, or incinerated and useful objects are recovered as raw materials (excluding Chemical recycle and thermal recycle).

○Total product weight: Total weight of the product for which recyclability is calculated.

Appendix-3 Degree of Product Disassembly

There are many product types that differ in the price, the employment of expensive materials/parts, the number of parts, the degree of unitization, and the use of chemical substances with environmental impacts. It is difficult to measure such wide-ranging products with a single assessment approach or a single set of standards. Thus, it is needed to decide the degree to which the product is disassembled by each individual product, clarifying the purpose of disassembly. Purpose of product disassembly include the following two, at least:

[1] Disassembly from the perspective of proper disposal
[2] Disassembly from the perspective of Recycle

In [1], removal of parts containing chemical substances with environmental impacts shall be conducted primarily. In addition to the products specified as "products with an obligation to have easy-to-remove design" in the Specified Resources-Recycled Products of the Law for the Promotion of Effective Utilization of Resources (e.g. secondary batteries and fluorescent lamp), parts containing substances that may cause problems during incineration and/or landfill, should also preferably be designed with an easily removable feature. If manufacturers neglect to take such measures, it can lead to increased cost because such products are obliged to be transferred to controlled or strictly-controlled landfill sites, or such products may be refused to be accepted by disposal businesses.

In [2], the disassembly of the products should be implemented in accordance with the intended Recycle strategy for their parts/materials. Products that were eco-designed (e.g. plastic materials have identification symbols, product disassembly can be easily implemented, parts are unitized, and etc.) can be disassembled with enhanced recyclability.

Cost efficiency is also important in continuous implementation. Although the balance between disassembly cost and profit on the sale of disassembled parts is difficult to predict because it significantly varies according to the trends in the second-hand market, the economic performance including manpower cost shall be considered as far as possible.

The following is an example of disassembly standards taking into account the above. As mentioned at the beginning of these Guidelines, the product design shall be determined taking into account various requirements of each product.

【Example of disassembly standards】

(a) Remove parts containing chemical substances with environmental impacts (e.g.

batteries, and lead-containing parts)

(b) Remove large-sized parts for recycle or size and weight reduction through incineration (e.g. exterior materials etc.)

(c) Remove unitized parts (e.g. LCD, and etc.)

(d) Remove expensive parts (electronic substrate, cables, and etc.)

(e) Remove parts that are made from materials clearly suitable for material recycle

(f) Disassemble the entire product to the part/material level excluding parts difficult to disassemble (bonded parts, etc.)

Provisional Translation

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