Closed-Loop Recycling of Label Release Film

資源循環プロジェクト

Resource Recycling Project

NEION Film Coatings Corp.

TOYOBO TOYOBO CO.,LTD.

SHIONOGI Shionogi Pharma Co.,Ltd.

TOPPAN INFOMEDIA CO., LTD.

Mitsui Bussan Chemicals Co., Ltd.

Problem presentation

“Paper release liners”: 1.39 billion m² of waste per year

What are “paper release liners”? ▶ **These are backing sheets for labels that are used until just before the labels are applied to various types of products.**

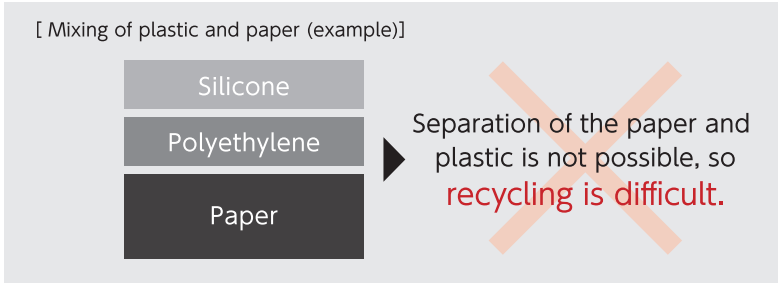
“Paper release liners” are backing sheets that are essential with regard to the manufacturing and use of labels. Even though these are essential, it has not been possible to recycle them. **As a result, each day, they generate huge amounts of waste that is not visible to consumers, and continuously undergo disposal & incineration.**

In the Japanese manufacturing industry as a whole, the volume of such waste has risen to **1.39 billion m² per year.**

Why is it not possible to recycle paper release liners?

In the case of “paper release liners,” a paper surface is coated with a resin such as **silicone or polyethylene.**

Separation of the paper and resin is not possible, so recycling is difficult.



“Making label use eco-friendly”

Labels are valuable in that they convey the reliability, safety, and attractiveness of products to consumers.
In order to support the sustainable use of labels, we are proposing labels that feature backing sheets that do not generate waste.

*Calculated based on “Label Market of Japan 2022” issued by Label Shimbun Co.

Social transformation

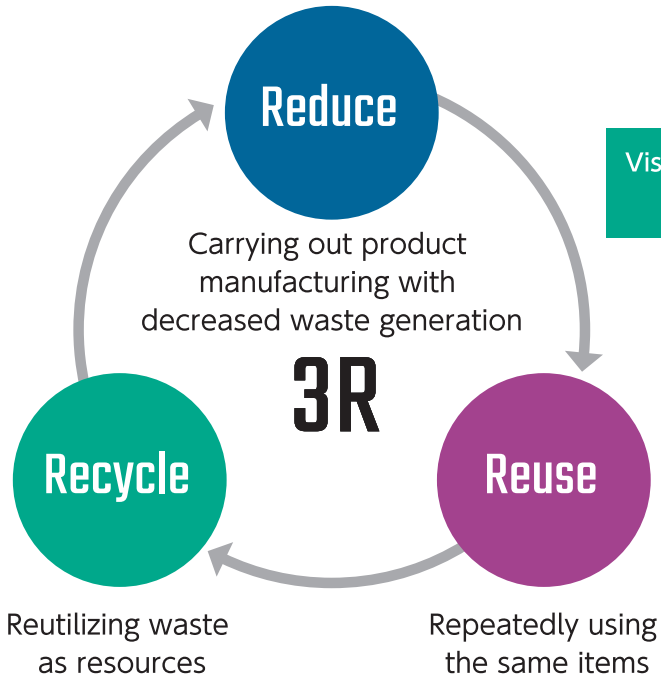
Vision for Japanese economy: circular economy

Environmental policy of Japan: “transitioning to circular economy”

A “circular economy” is an economic system centered on the concept that products, raw materials, and so on (that were previously being disposed of during economic activities) are circulated as “resources,” and thus from the design stage and beyond, waste is not generated.

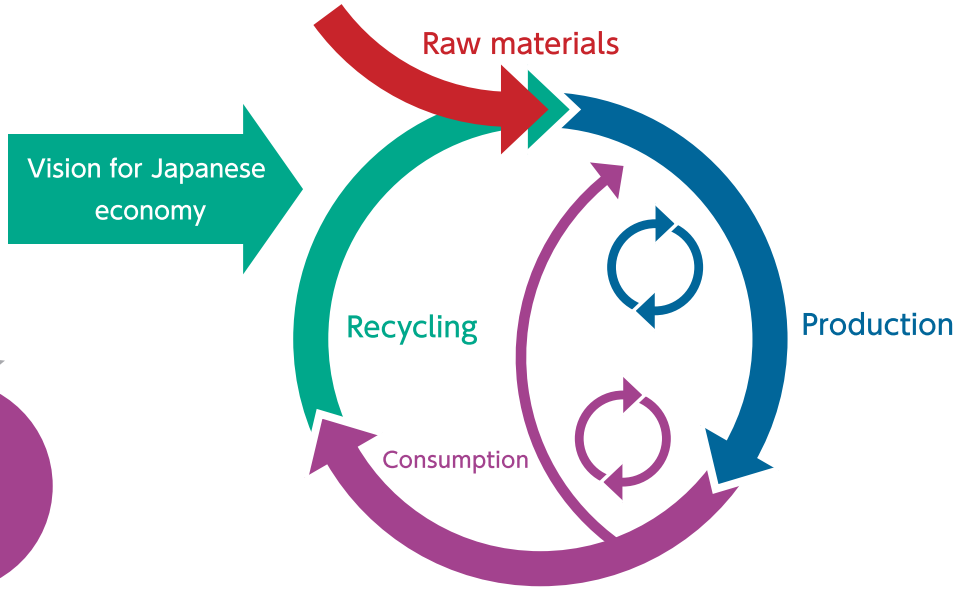
3R

Activities that reduce waste



Circular economy

Activities in which waste is not generated



Among the guidelines of the Ministry of the Environment, circular economy-related initiatives are considered to be of the utmost environmental value, and a circular economy has been positioned as the future vision for the Japanese economy.

Social transformation

Vision for Japanese economy: circular economy

Promotion based on public-private collaboration

Japan Partnership for Circular Economy (J4CE)

J4CE
JAPAN PARTNERSHIP
FOR CIRCULAR ECONOMY

This is an organization that was launched by the Ministry of the Environment, the Ministry of Economy, Trade and Industry, and the Japan Business Federation in 2021.
Efforts aimed at the achievement of a circular economy have been accelerating worldwide, and amid this situation, the objective of this organization is to strengthen public-private collaboration with the aim of further fostering understanding and promoting initiatives regarding a circular economy among a wide range of parties including Japanese companies.
The Resource Recycling Project is a project that was selected to appear in the "J4CE Featured Cases (2022)."

Act on Promotion of Resource Circulation for Plastics

Overall lifecycle of products that make use of plastics

Promotion of resource recycling at all stages

The objective of this law is not simply "reducing" the generation of plastic waste, but rather it is "having economic activities be carried out based on the premise that plastic waste will not be generated." It came into force on April 1, 2022.
As part of the Resource Recycling Project, operations for the collection of used label backing sheets were started in April 2022.

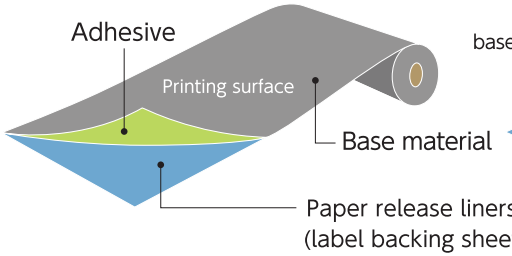
Solution

“Resource Recycling Project”: circular horizontal recycling of label backing sheets

Mechanism for creation of labels

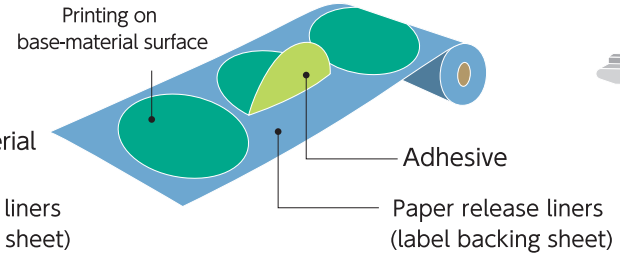
1 /// NEION

Sheets are manufactured that consist of three layers: a base material, an adhesive, and a paper release liner (label backing sheet).

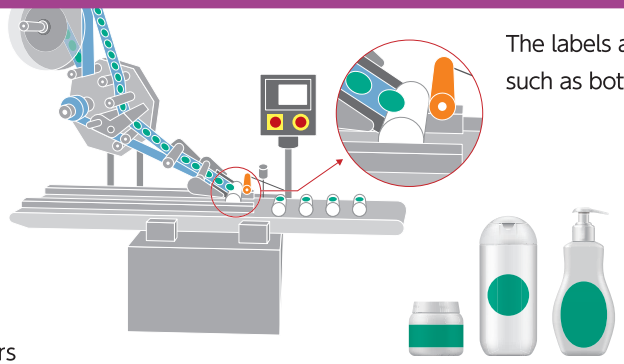


2 PRINT

Printing processing and cutting processing (removing margins and forming the labels into the shape that will be used) are carried out.



3 USER



The labels are applied to final products such as bottles and packages.

In the end, only the paper release liner (label backing sheet) remains.

Unique achievement of **Resource Recycling Project**: “horizontal recycling*1 of label backing sheets”

If the “paper release liners” are replaced with “recycling-dedicated backing sheets” that have been designed from materials that enable material recycling*2, it becomes possible to carry out the valuable recovery of used label backing sheets from users.

*1This is a recycling method in which used products are used again for the same application.

*2This is recycling in which scrap-plastic waste is processed through pulverization & dissolution, etc., and then reused as raw materials for the same application.

[Importance of horizontal recycling]

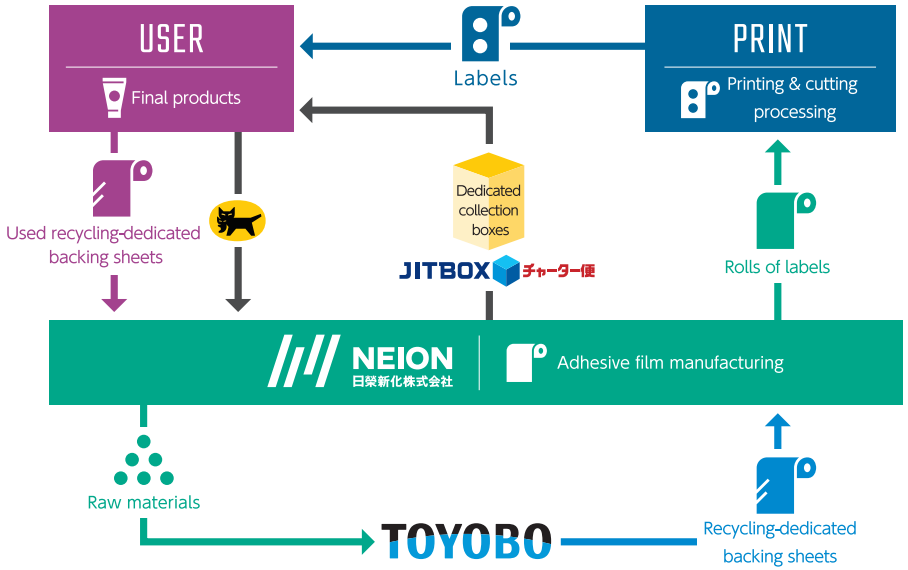
In order to establish high-level resource recycling, it is important to “return materials to their previous state.”

Based on a scheme in which materials are returned to being “label backing sheets” while thoroughly improving quality and streamlining costs, an effort is made to minimize waste generation and CO_2 emissions.

Participation

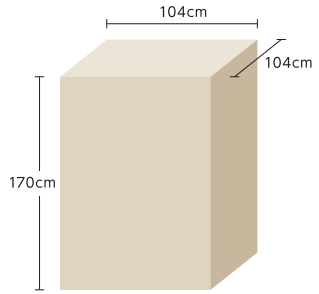
“Resource Recycling Project”: circular horizontal recycling of label backing sheets

Circular recycling scheme for label backing sheets



Method for collection of recycling-dedicated backing sheets

ヤマトボックスチャーター JITBOX チャーター便



Approximately 300 kg
(equivalent to 6,000 m²) of recycling-dedicated backing sheets can be inserted.

- The valuable recovery of used “recycling-dedicated backing sheets” can be carried out for 20 yen/kg.
- Collection boxes are installed, and our Secretariat covers the collection expenses.

USER
The customer requests installation via the Resource Recycling Project website.

Step 2

The customer is asked to insert recycling-dedicated backing sheets into the box until it is full.

Step 3
USER
The customer requests collection via the Resource Recycling Project website.

Step 4

The customer is visited for collection, with NEION covering the cost of this.

*The collection cost is included in the label price.

Solution

“Resource Recycling Project”: circular horizontal recycling of label backing sheets

Synthetic paper created from PET bottles TOYOBO Synthetic paper for labels KAMISHINE™

The recycling-dedicated backing sheets have been designed based on Kamishine™ of Toyobo.

Kamishine™ **is an environmentally-friendly material made from 25% or more recycled PET bottle raw materials.**

Furthermore, while ordinary PET films have a specific gravity of 1.4, this material **achieves a lighter specific gravity of 1.0** and thus contributes to “reducing.”

Kamishine™ has the properties of both paper and film and is environmentally friendly, so it is the **optimal material for the Resource Recycling Project.**

Item		Unit	Product name		Measurement method
			Kamishine	Recycled Kamishine (laboratory-equipment product)	
Thickness		μm	50	50	In accordance with JIS C-2318
Total light transmittance		%	18.0	18.2	In accordance with JIS K-7105
Tensile strength	MD	MPa	115	107	In accordance with JIS C-2318
	TD	MPa	125	125	
Elongation rate	MD	%	80	73	
	TD	%	35	30	
Heat shrinkage rate	MD	%	1.4	2.0	In accordance with JIS C-2318
	TD	%	0.4	0.3	

*All of the above data are representative values and are not guaranteed values.
*Recycled Kamishine is a product under development, so changes may be made to its design without notice.

[Characteristics]

Reduce

Due to a hollowed-out structure,
an approximately 30% reduction of raw materials
has been achieved.
(Comparison with general PET films)

Approximately 30% weight reduction

Recycle

This is an environmentally friendly material
made from 25% or more
recycled PET bottle raw materials.

Synthetic paper from PET bottles

Due to the lighter weight and use of recycled PET bottle raw materials,
CO_2 emissions are reduced by 34%!
(Comparison with case of producing PET film of the same thickness)

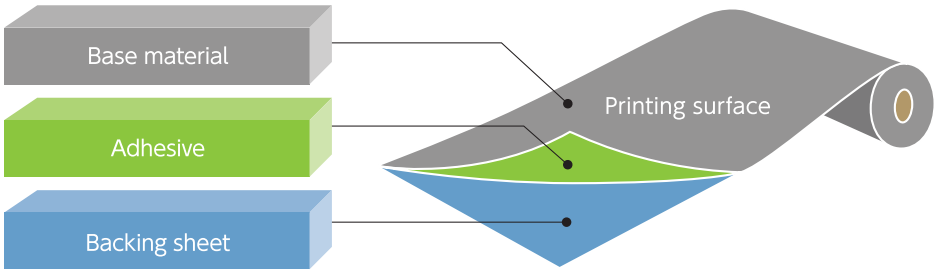
PETボトル再利用品 Reused PET bottles

Solution

“Resource Recycling Project”: circular horizontal recycling of label backing sheets

ECOMASS エコマスシリーズ

PETボトル再利用品 Reused PET bottles × バイオマス使用部位：粘着剤 No.190460 ×



Base material
Film made from recycled raw materials

Adhesive
Biomass adhesive

Backing sheet
Recycling-dedicated backing sheet

Through using film that includes recycled raw materials, an approximately 25% reduction of CO_2 emissions is achieved. Due to the use of an adhesive coating with a high level of smoothness, a clean printing finish can be expected. Furthermore, Ecomass label adhesives have acquired Biomass Mark certification.

[Main lineup of base papers]

Product name	Adhesive	Application	Manufacturer
Ecomass Label, Clear, 50/Recycled AS	Solvent	For general stickers	NEION Film Coatings Corp.
Ecomass Label, Silver, 50/Recycled AS	Solvent	For general stickers	NEION Film Coatings Corp.
Ecomass Label, White, 50/Recycled AS	Solvent	For general stickers	NEION Film Coatings Corp.
Ecomass Label, Clear, 50 MED/Recycled	Solvent	For medical products	NEION Film Coatings Corp.
Ecomass Label, Silver, 50 MED/Recycled	Solvent	For medical products	NEION Film Coatings Corp.
Ecomass Label, White, 50 MED/Recycled	Solvent	For medical products	NEION Film Coatings Corp.
Art <73> MED/Recycled	Solvent	For medical products	NEION Film Coatings Corp.
Kamishine Extra Sticky, Resource Recycling F	Emulsion	For general stickers	SP Tack Co., Ltd.
Thermal Extra Sticky, Resource Recycling F	Emulsion	For general stickers	SP Tack Co., Ltd.

*The “MED” series has received the same certification as representative adhesives for medical-product applications.
*Requests for customization can be accommodated regarding these and other base papers.

Solution

“Resource Recycling Project”: circular horizontal recycling of label backing sheets

It has been verified in various tests that the products can be used under the same processing conditions & equipment conditions as with conventional products.

Simply switching to recycling-dedicated backing sheets

What we would like to ask of customers is simply for them to switch from label backing sheets to “recycling-dedicated backing sheets.” The conditions for participation are extremely simple.

[Ink adhesion test]

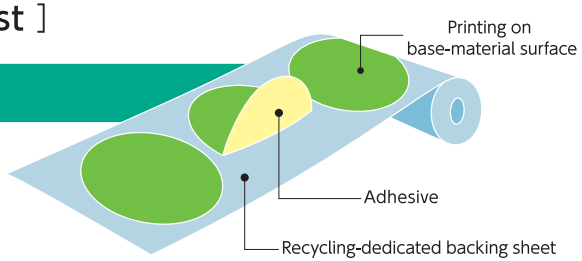
Ink	Printing method	Ecomass Label, Clear, 50/Recycled AS	Ecomass Label, Silver, 50/Recycled AS	Ecomass Label, White, 50/Recycled AS
TOKA UV-161	Offset	○	○	○
TOYO Biomass	Offset	○	○	○
TOKYO Vegetable Oil	Offset	○	○	○
TOKA UV Flexo	Flexo	Tape : ○ Scratch : ×	Tape : ○ Scratch : ×	Tape : △ Scratch : ×

*Crosscut only is not acceptable.
*Suitability has been confirmed regarding printing on Kamishine base materials that have been manufactured from a mixture of collected recycling-dedicated backing sheets, and regarding eye-mark printing on backing-sheet back surfaces. [TOKA UV161/Offset]

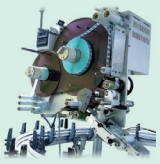
[Cutting processing test]

What is cutting processing?

This is processing during the process of label formation in which margins are removed by inserting blades from the label surface partway into backing sheets.



[Labeler test]

	General labeler	High-speed labeler	Tabletop-size labeler
Test speed	Up to 60 m/min	Up to 110 m/min	Up to 16 m/min
Main application	Daily commodities, food products, medical products, industrial parts, building materials, etc.	Beverage bottles and campaign labels	Tabletop-size, low-priced labeler for cylindrical containers
Test equipment	TL-R512 	S-51V 	TL-R05 

*In some cases, advance design adjustments may be needed depending on the size of the campaign label and the line speed.

Participation

“Resource Recycling Project”: scheme and benefits of participation

Four benefits of Resource Recycling Project

MERIT 01
Reduction of industrial waste
Participation in circular economy

MERIT 02
Reduction of CO_2 emissions
Concrete measures for achievement of carbon neutrality

MERIT 03
Improvement of material recycling rate

MERIT 04
Consideration for future taxation levels
Preparation for carbon pricing

The environmental benefits of the Resource Recycling Project will be visualized, and these will be presented to participating customers in “reports.”

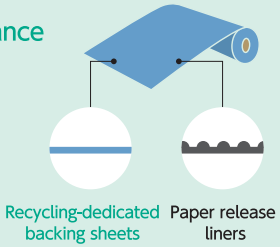
Various benefits of designing with recycling-dedicated backing sheets

1. Cleanrooms

Switching from paper release liners to recycling-dedicated backing sheets enables processing in cleanrooms of up to Class 1,000. Thus, recycling-dedicated backing sheets are optimal for applications with especially strict contamination management, such as medical products, food products, and industrial uses.

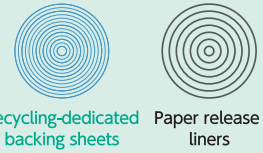
2. Improved aesthetic appearance

Recycling-dedicated backing sheets have greatly improved surface smoothness compared with paper release liners. This causes the adhesive layer to be smooth, and the result is that even the printing surface has a very beautiful finish.



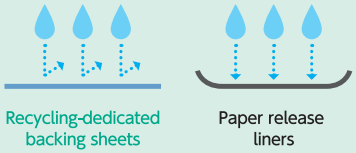
3. Increased compactness

Recycling-dedicated backing sheets are thinner than paper release liners yet have equal or greater strength. This means that a greater number of labels can be rolled into rolls of the same diameter, and this helps to boost the production efficiency of customers.



4. Decreased warpage

Unlike paper release liners, recycling-dedicated backing sheets do not absorb moisture. Therefore, curling caused by moisture absorption & desorption is greatly reduced.



Participation

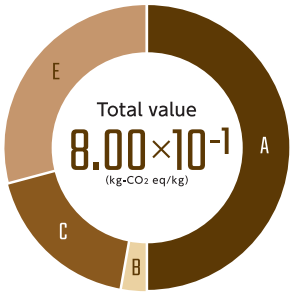
“Resource Recycling Project”: scheme and benefits of participation

Effects of reducing CO_2 emissions through Resource Recycling Project

Calculation model making using of Mitsui & Co. decarbonization platform “LCA Plus”

[CO_2 emissions per square meter]

Conventional label ±0%

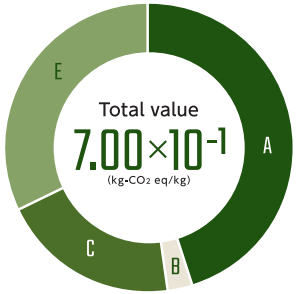


[Cross section (example)]

PP synthetic paper (80μ)	Adhesive (18μ)	Direct glassine paper release liner (66μ)

	Emissions (kg-CO_2/eq)	Percentage
A Raw-material procurement	3.99×10^{-1}	49.89%
B Transport	2.58×10^{-2}	3.23%
C Production	1.42×10^{-1}	17.82%
D Use	0.00	0%
E Disposal & recycling	2.32×10^{-1}	29.06%

Switching of backing sheet only -12.4%

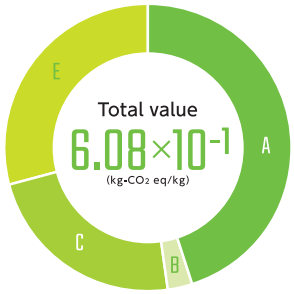


[Cross section (example)]

PP synthetic paper (80μ)	Adhesive (18μ)	Recycling-dedicated backing sheets (50μ)

	Emissions (kg-CO_2/eq)	Percentage
A Raw-material procurement	3.12×10^{-1}	44.56%
B Transport	2.19×10^{-2}	3.12%
C Production	1.42×10^{-1}	20.35%
D Use	0.00	0%
E Disposal & recycling	2.24×10^{-1}	31.97%

Ecomass Label -23.9%



[Cross section (example)]

Kamishine (50μ)	Adhesive (15μ)	Recycling-dedicated backing sheets (50μ)

	Emissions (kg-CO_2/eq)	Percentage
A Raw-material procurement	2.73×10^{-1}	44.88%
B Transport	1.87×10^{-2}	3.07%
C Production	1.42×10^{-1}	23.42%
D Use	0.00	0%
E Disposal & recycling	1.74×10^{-1}	28.63%

[Case in which the abovementioned “direct glassine paper release liner (60 μ)” has been switched to “single-sided polyethylene-laminated-glassine paper (90 μ)”]

Conventional label ±0%

Switching of backing sheet only -22.1%

Ecomass Label -32.9%

The above results are for comparing conventional labels with Ecomass Labels for product LCA calculations, and they are not for determining the superiority of products.
In the above calculations regarding the three label products, the calculations are made based on the following independent standards.

- The amount of activity is calculated based on weight per square meter.
- Regarding all three products, among the product LCA processes, calculations were not made for “use.” In regard to the various conditions regarding the “transport” and “production” of raw materials, products, and waste, the calculations regarding all three products have been made based on the same conditions.

Conclusion "Resource Recycling Project": promotional video & contact desk for inquiries

Resource Recycling Project　Image video

資源循環プロジェクト
Resource Recycling Project

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Image video

Thank you for your attention.

If you have any questions, please do not hesitate to contact us via the contact desk below.

Contact desk for inquiries

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