Japan Partnership for Circular Economy

J4CE

JAPAN PARTNERSHIP
FOR CIRCULAR ECONOMY

Initiatives on the Circular Economy by Japanese Companies

Noteworthy Cases

Vol. 3 | *2024 Edition*

Introduction

The Japan Circular Economy Partnership (J4CE) was established on 2 March, 2021 by the Ministry of the Environment, the Ministry of Economy, Trade and Industry, and the Japan Business Federation (Keidanren) with the aim of strengthening public-private collaboration in Japan, aiming to further foster understanding of the circular economy and promote initiatives among a wide range of stakeholders, including domestic companies, as the trend toward a circular economy accelerates worldwide. The establishment of J4CE has attracted great interest, and as of the end of December 2024, more than 200 companies and industry associations have participated.

On the international front, in 2023, the G7 adopted the Circular Economy and Resource Efficiency Principles (CEREP), a set of behavioural guidelines to promote circular economy and resource efficiency in the private sector. In Japan, the Plastic Resource Circulation Act came into effect in April 2022, and the Act Concerning Sophistication of Recycling Business, etc. to Promote Resource Circulation was enacted in May 2024. As such, the foundations are being put in place for the promotion of resource circulation and circular economy through business collaboration. With this in mind, J4CE has been promoting knowledge sharing through public-private dialogue and e-mail newsletters (e.g. policy trends for participating companies, sharing of corporate cases), and providing a forum for business exchange among J4CE participating companies and organisations through face-to-face workshops, thereby building momentum for business collaboration. However, when discussions actually began, J4CE participating companies and organisations voiced concerns about not knowing how to build collaboration, and wanted to refer to previous cases.

Therefore, in order to realise the policy on building and promoting business collaboration cases for J4CE activities in 2024, we have selected noteworthy initiatives and compiled this collection of case studies under the theme of “Business collaboration on circular economy (CE),” focusing on collaboration with a wide range of stakeholders and the use of digital technology to support collaboration, while also taking into consideration aspects such as the originality of the approach and contribution to carbon neutrality and nature positivity.

We hope that these case studies will raise awareness both domestically and internationally with regards to the efforts being made to promote a circular economy through collaboration among business operators, including companies, organisations and local governments in Japan, and that it will help further spread such efforts and promote a circular economy in Japan and around the world.

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Case 01. Collection and film-to-film recycling of refill plastic packs

Summary and key points of the initiative

Kao Corporation has published a roadmap with the goal of achieving “zero waste” by 2040 and “negative waste” by 2050. Under this roadmap, the company is innovating by developing refill packs that use less raw materials and transforming them from film to film.

In order to make this an end-to-end initiative from collection to the production of recycled materials and then to the production of refill packs using recycled materials, the company began collaborating with Lion Corporation in 2020, and in May 2023, both Kao Corporation and Lion Corporation implemented the technology for film-to-film recycling for refill packs, and launched the first refill pack product (Okaeri Refill Pack) made partly from recycled materials.

Used refill packs, which are the raw material for the recycled materials, are collected at some stores of Ito-Yokado Co., Ltd. and Welcia Pharmacy Co., Ltd., and a system has been established whereby Hamakyorex Co., Ltd. collects them using the return journey after delivering products to Welcia Pharmacy Co., Ltd.

Furthermore, in order to increase collection, posters were put up at each store and awareness-raising activities were carried out by Kamakura City. Furthermore, Kao Corporation and its group company Kao Logistics Co., Ltd. have obtained “voluntary collection certification by manufacturers and distributors,”[1] a measure under the Plastic Resource Recycling Act, for the collection of plastic packaging containers carried out at Kao’s business sites and Kamakura City. This means that collection is now possible at Kamakura City and Kao Corporation’s business sites without the need for a business license under the Act on Waste Management and Public Cleansing marking the first step towards greater efficiency through the full-scale utilisation of arterial logistics and strengthening collaboration with local governments.

Used refill packs → Collecting → Crushing/washing → Pelletising → Recycled refill pack

Recycling flow of used plastic packaging

Members and their roles

Kao Corporation	Recycling used refill packs, developing film-to-film recycled products
Lion Corporation	Developing film-to-film recycled products
Ito-Yokado Co., Ltd., Welcia Pharmacy Co., Ltd.	Installing collection boxes at stores, considering effective collection systems
Hamakyorex Co., Ltd.	Building an efficient collection system that utilises return deliveries to Welcia Pharmacy Co., Ltd.
Kao Logistics Co., Ltd.	Collection, transportation and sorting of used refill packs collected within the Kao Group and in Kamakura City
Kamakura City	Establishment, management and consolidation of collection centres in Kamakura City

Effects of the initiative

In May 2023, Kao Corporation and Lion Corporation will launch the first refill pack product (Okaeri Refill Pack), which embodies the technology for film-to-film recycling for refill packs, made in part from recycled materials.

Future outlook

- By reducing costs from collection, transportation and recycling, we aim to improve the economic rationality of products that use recycled materials and increase the value of the products themselves.
- Because collection patterns that have been approved for voluntary collection can be applied and deployed in other regions, we are working to quickly expand collection areas.

1 This is one of the measures in the “Act on Promotion of Plastic Resource Recycling” (Plastic Resource Recycling Promotion Act), which came into effect on 1 April, 2022. Certified businesses are required to comply with the scope of the plan. A business license under the Waste Management and Public Cleansing Act is no longer required, and manufacturing and sales businesses without a license can carry out collection and recycling.

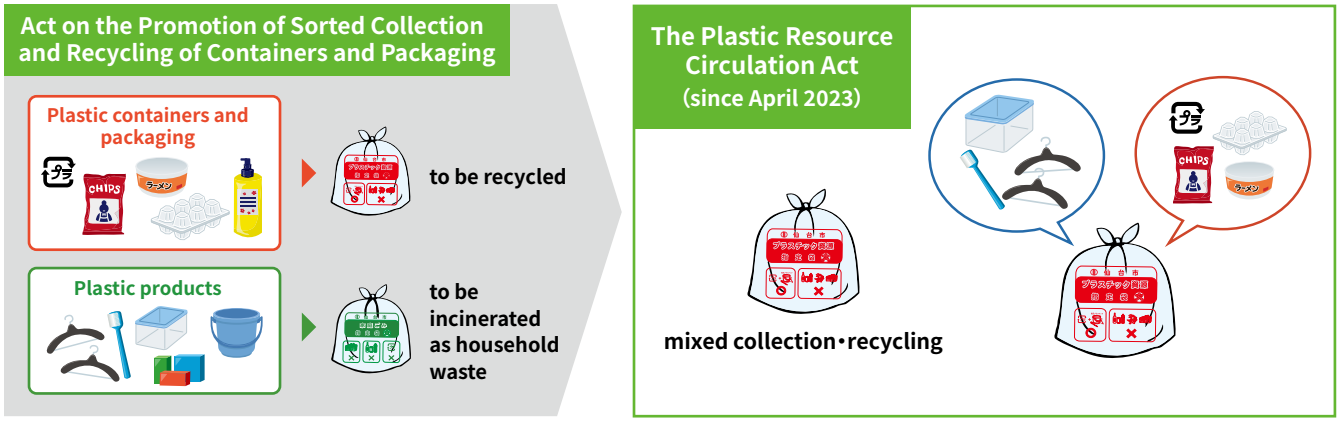
Case 02. Public-private partnership plastic resource circulation initiative

Summary and key points of the initiative

Plastic waste generated from households comes in a variety of shapes and materials, and can contain foreign matter. The recycling industry is faced with the challenge of how to efficiently process and reuse this “miscellaneous plastic waste.”

The Plastic Resource Circulation Act, which came into effect in April 2022, aims to comprehensively promote the 3Rs (reduce, reuse and recycle) for plastic waste. In September 2022, Sendai City, in collaboration with J&T Recycling Corporation which has the technology to sort, process and recycle miscellaneous plastic waste, became the first city in Japan to obtain ministerial certification[2] for its recycling plan based on the Plastic Resource Circulation Act. This has enabled Sendai City to carry out the entire process from sorting to recycling at J&T Recycling Corporations facilities in the city for plastic products, and plastic containers and packaging generated by households throughout the city.

With the certified plan, the annual recycling volume at J&T Recycling Corporation which used to fluctuate depending on the results of tenders in a single year, is now constant, which has led to business stability. In addition, Sendai City is able to design the recycling method itself, and together with J&T Recycling Corporation the recycling implementer, they are inventing and devising ways to recycle waste into products familiar to citizens, according to the local situation.



Members and their roles

J&T Recycling Corporation	Recycling business operator (technical verification of sorting and recycling, collection and recycling)
Sendai City	Recycling plan applicant (collection of plastic containers and packaging, and product plastics, consideration of recycling uses, public awareness campaigns for consumers, etc.)

Effects of the initiative

By collecting plastic products in addition to plastic containers and packaging traditionally collected by municipalities, we will reduce the amount of plastic waste for incineration[3], achieving both resource circulation and CO_2 reduction.

- Trend in plastic resource recovery (FY) (R4→R5): 12,860t→14,261t (+10.9%)
- Trend in plastic resource recycling (FY) (R4→R5): 12,324t→13,469t (+9.3%)
- Trend in CO_2 reduction (estimate) (FY) (R4→R5): 28,672tCO_2→31,795tCO_2

Future outlook

As products familiar to citizens, we aim to recycle plastics and turn them into garbage bags for local cleanups and planters (horticultural products). Sendai City is using the planters to conduct awareness-raising activities and promote “visualisation of recycling.”

2 A system whereby municipalities prepare recycling plans independently or jointly based on Article 33 and the competent minister approves them, thereby enabling the integration and rationalisation of intermediate treatment processes such as sorting and compaction, which were previously carried out by the municipalities and the recycling implementer respectively under the Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging.

3 Comparison with FY2022, as batch collection of product plastics started in FY2023. Factors from the Greenhouse Gas Emissions Calculation and Reporting Manual (Ver 4.9) (April 2023) were used. Estimated CO_2 reductions from not incinerating plastic resources (CO_2 emissions from recycling etc. are not included).

Case 03. Obtaining and utilising accreditation for the Recycling Business Plan (the 2nd accreditation) under the Plastic Resource Circulation Act

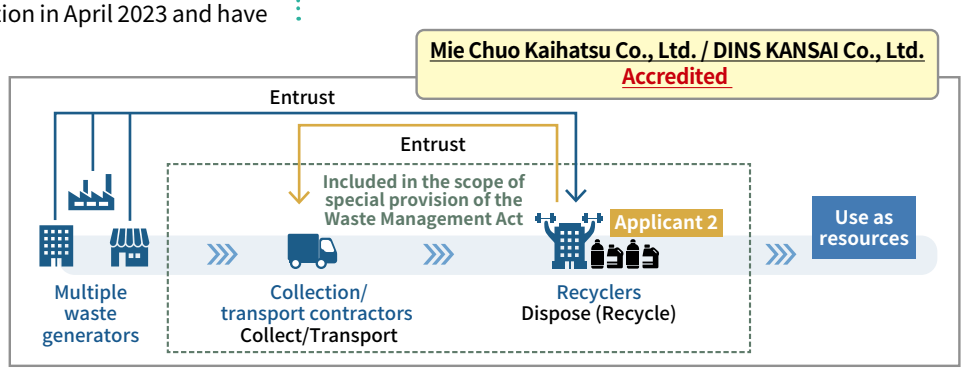
Summary and key points of the initiative

Since there are many types of plastic waste, and it is inefficient for each waste generator to deal with each type individually, a wide-area collection scheme is necessary. In addition, while most waste plastic has generally been incinerated or landfilled, there is a growing social demand to reduce the environmental impact and to use resources more effectively.

To solve these issues, Daiei Kankyo Co., Ltd. decided to utilise the "Recycling Business Plan" accreditation system[4] stablished under the Plastic Resource Circulation Act. Our Group companies Mie Chuo Kaihatsu Co., Ltd. and DINS Kansai Co., Ltd. obtained accreditation in April 2023 and have been collecting and recycling waste plastics from five waste generators, including Daiwa House Industry Co., Ltd., Masu Cold Foods Co., Ltd. and Pilot Ink Co., Ltd. The collected plastic waste is made into pellets through optical sorting, crushing and washing, and then recycled into pallets at Plafactory Co., Ltd. By establishing a system to collect waste plastics from multiple waste generators and recycling them efficiently, it is expected to reduce costs and enhance the efficiency of resource recycling while raising environmental awareness and strengthening competitiveness throughout the entire Group.

Article 48, Paragraph 1, Item 2

An applicant and a person entrusted with collecting or transporting industrial waste of plastic products, etc. discharged by multiple waste generators on consignment, does not need a business license under the Waste Management Act.



Accreditation of recycling plan

Members and their roles

Mie Chuo Kaihatsu Co., Ltd. (Daiei Kankyo Group)	Formulation of Recycling Business Plan, collection and recycling, pellet production
Daiwa House Industry Co., Ltd., Masu Cold Foods Co., Ltd., Pilot Ink Co., Ltd. and two other companies	Generators of plastic-containing product industrial waste, etc.
Plafactory Co., Ltd. (Daiei Kankyo Group)	Manufacturing of recycled pallets, etc.

Effects of the initiative

A total of 512 tonnes was collected from the five partner companies, with a recycling volume (rate) of 38%. The amount of recycled products (or recycled material mixing rate) was 194.98 tonnes (Mie Chuo Kaihatsu Co., Ltd.; from the result of the fiscal year 2023)

Future outlook

- Through value creation for consumers, we aim to reduce processing costs and establish a business that can ensure stable profitability.
- By expanding collaboration with waste generators, we are expanding the number of collection targets and promoting the advancement of resource circulation.
- In cooperation with local cities and towns, we aim to expand participation in the Recycling Business Plan accredited[5] under Article 33 of the Act.
- In addition to material recycling, we are also considering the introduction of chemical recycling, and are continuing to take on further challenges toward a decarbonised, circular economy.

4 Based on Article 48 of the Plastic Resource Circulation Act, (1) a discharging business or (2) a recycling business entrusted by multiple discharging businesses creates a plan, and the competent minister certifies the plan. A system that eliminates the need for business permission based on the Act on Waste Management and Public Cleansing.

5 Based on Article 33 of the Plastic Resource Circulation Act, if a municipality has created a plan and the competent minister has approved it, the municipality and recycling business may each carry out the plan under the Containers and Packaging Recycling Act. A system that enables the integration and rationalization of processes such as sorting and compression.

Case 04. Sustainable Plastics Initiative (SusPla), collaboration among companies aiming to expand the market for recycled plastics

Summary and key points of the initiative

Plastic recycling is a multi-step process involving waste producers, recycling businesses, manufacturers, government and consumers, so collaboration between these businesses is important to achieve efficient recycling. In addition, quality variations and supply instability are major factors that make product manufacturers hesitant to adopt recycled materials.

In this context, SusPla, a voluntary organisation that brings together various stakeholders involved in plastic recycling and provides a platform aimed at expanding the recycled plastic market through material recycling, was established in July 2024. Various stakeholders involved in plastic recycling have joined the SusPla, and the organisation is scheduled to be incorporated in 2025.

SusPla aims to double the use of recycled plastics through material recycling in Japan by 2030, and is implementing and expanding its activities based on the following four points.

- Promoting, disseminating, and socially implementing a certification system (SPC certification) that contributes to ensuring the quality and stable supply of recycled plastics
- Developing environmental performance indicators (product environmental indicators that match carbon neutral policies)
- Solving issues related to building cooperation between upstream and downstream entities along the entire supply chain of plastic recycling
- Promoting understanding of recycled plastics throughout society

SusPla (Sustainable Plastics Initiative)

Towards expanding the market for recycled plastics through material recycling that contributes to quality improvement and stable supply

Build multi-stakeholder partnerships
by connecting manufacturing industries, recycling industries, research institutions, government agencies, support organisations, etc.

16 July 2024 (at the time of establishment)
General Members: 62 companies and organisations,
Special members: 5 organisations,
Special observers: 2, Obervers: 4

Members and their roles

Ishizuka Chemical Sangyo Co., Ltd., ISONO Co., Ltd., Ohmi-Bussan Co., Ltd., Sustainable Management Promotion Organization (SuMPO), SEKISUI CHEMICAL Co., Ltd., Daiei Kankyo Co., Ltd., TAIBO Co., Ltd, DENSO CORPORATION, Toyama Kankyo Seibi Co., Ltd., TOYOTA MOTOR CORPORATION, Panasonic Environmental Technology Solutions Co., Ltd., Mitsui Chemicals, Inc.	Board of Directors/ Executive Committee
As of the end of January 2025, there are 125 members (from a wide range of industries such as automobiles, home appliances, chemicals, plastic molding and processing and textiles as well as universities and research institutes, and local governments) from both upstream and downstream entities, including Japan's leading recyclers, manufacturers and trading companies, and the number of members continues to increase.	Members

Effects of the initiative

From 2024, a certification system has been developed for businesses or factories that meet the requirements for material recycling that can accurately respond to market needs.

Future outlook

In order to increase the amount of resource circulation, we aim to improve the supply business and supply system (construction of a collection system, creation of quality that can meet needs, standardisation of recycled plastics for that purpose, etc.), activities that encourage a change in awareness of consumers and society (issuance of joint declarations and disclosure of related information, etc.), and a shift in industry to "resource circulation manufacturing (resource circulation design, circular economy-based manufacturing, etc.)".

6 SusPla is taking the lead in developing this new certification system, which is expected to be institutionalised in impartial organisations. in the future. Certification can be obtained on a business or factory basis. (Refer to the Sustainable Plastics Initiative (SusPla) overview document)

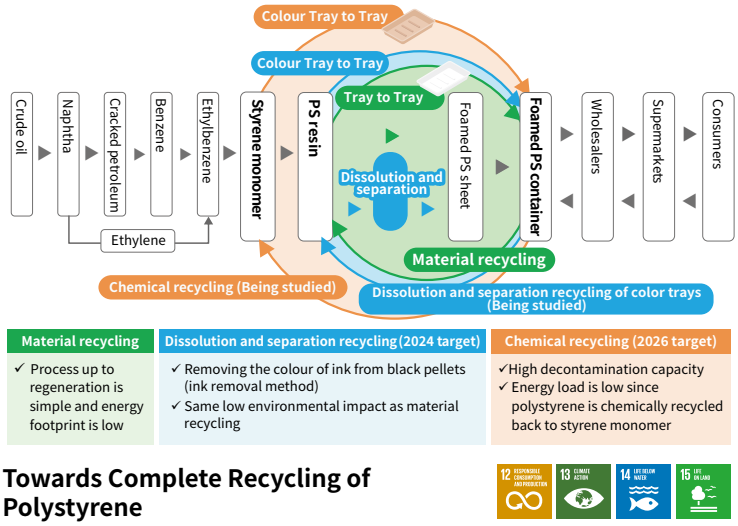
Case 05. Achieving complete recycling of polystyrene with the world's first dissolution and separation recycling technology and a recycling loop with four parties

Summary and key points of the initiative

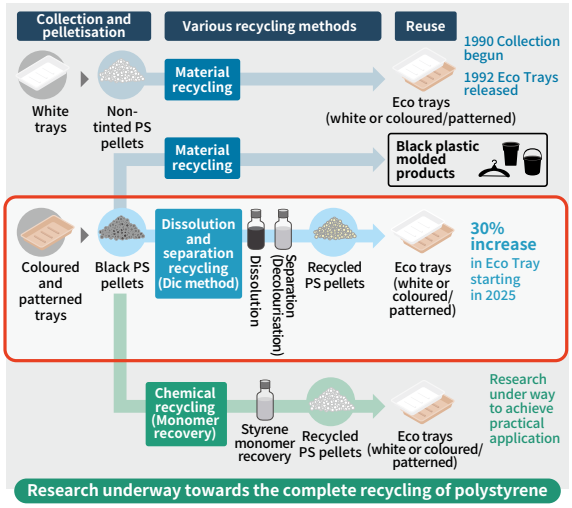
There are various challenges when recycling food trays such as the diversity and mixture of materials, and dirt and food residue, which is why it is important that all four parties involved — consumers, stores that collect used trays, businesses that take back used trays from them, and recyclers — work together to establish an appropriate collection and collection system.

FPCO Group, which advocates "tray-to-tray" recycling, is working to collect and recycle used food trays from approximately 10,000 collection points installed in supermarkets and other locations. An efficient and sustainable four-party recycling loop has been established by utilising the return trips of trucks used for product delivery to transport collected trays.

Separately from this, DIC and FPCO have developed a new dissolution and separation recycling technology (DIC method: Deinking chemical process) that makes it possible to remanufacture "tray-to-tray" even if coloured and white foamed trays are mixed, and have begun collaborating on a complete recycling system for foamed PS containers made from polystyrene. In addition, we are also working on recycling polystyrene using chemical recycling technology to reduce it to styrene monomer, the raw material for polystyrene, and through these comprehensive efforts, we aim to achieve complete circular recycling of polystyrene.



Towards Complete Recycling of Polystyrene



Members and their roles

FPCO	Collection and recycling
DIC	Dissolution and separation recycling, chemical recycling
Consumers	Washing, drying and sorting
Supermarkets	Store collection
Packaging wholesalers	Collection and transportation

Effects of the initiative

> There are approximately 10,680 collection bases nationwide (as of the end of March 2024). Eco-products using recycled materials produced at recycling bases account for 48% of product sales, and sales of eco-products exceed JPY 78.8 billion per year.

> Compared to virgin petrochemical products, the company achieved a reduction in CO_2 emissions of approximately 202,000 tonnes per year in the fiscal year ending March 2024.

> In the "Recycling Carbon Offset Declaration" announced on 1 February, 2021, the company set a goal of balancing the reduction amount with the CO_2 emissions of the entire company (production, logistics, and office divisions) by the fiscal year ending March 2025, but achieved the goal one year ahead of schedule.

Future outlook DIC Corporation's Yokkaichi Plant plans to manufacture and sell eco-trays made from used trays through closed loop recycling starting in 2025. Eco-tray production volume is expected to increase by 30% compared to previous years.

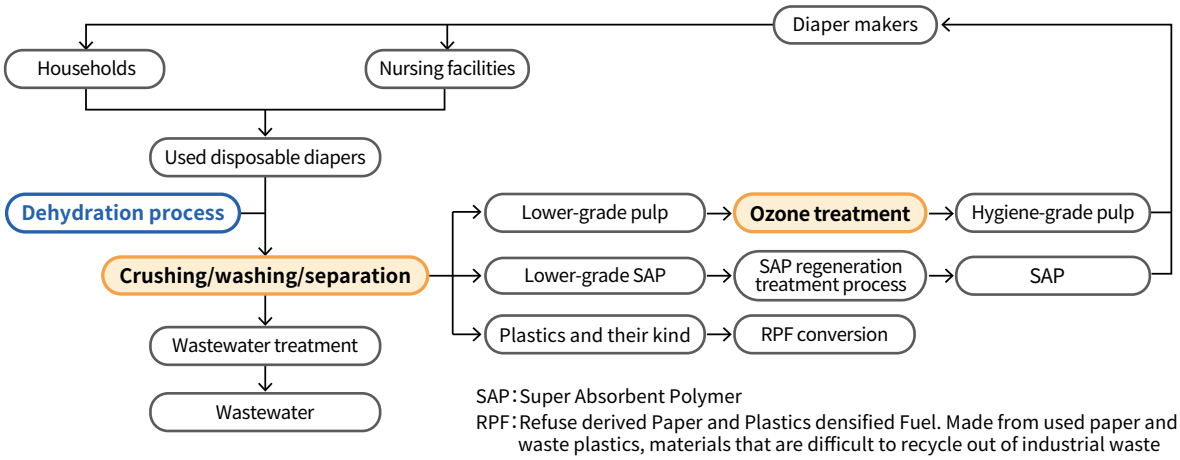
Case 06. Building a circular model across the product life cycle by implementing a recycling system for used disposable diapers

Summary and key points of the initiative

In Japan, where the ageing population is increasing, the market for disposable diapers and other related products is expected to grow, so it is important to reduce the environmental impact of disposable diapers. On the other hand, in order to recycle used disposable diapers, consumer understanding and cooperation in sorting and collection are essential.

To that end, Unicharm Corporation launched the "RefF (Recycle for the Future)" project to create a future where sanitary products are not disposable, based on the world's first horizontal recycling technology for disposable diapers using ozone treatment technology. In addition, creating a scheme for collecting used disposable diapers in cooperation with each local government will lead to the spread of RefF activities, and as such, in May 2016, Shibushi City, Kagoshima Prefecture, participated in the "Used Disposable Diaper Recycling Promotion Council," which is composed of 18 organisations and individuals. Subsequently, a partnership was formed with Soo Recycling Center Ltd. and Osaki Town to begin efforts toward horizontal recycling of disposable diapers. In 2020, we installed recycling equipment at Soo Recycling Center Co., Ltd. and are strengthening our efforts to establish a recycling system that can be used both domestically and internationally.

As a result, products using pulp extracted from recycled disposable diapers as part of the material for disposable diapers have been sold at some nursing facilities in Kagoshima Prefecture from June 2022, and at general stores in 2024, realising horizontal recycling of used disposable diapers. Unicharm Corporation aims to create a world where "products made from used disposable diapers" are the norm, rather than disposable diapers becoming disposed of as garbage.



SAP：Super Absorbent Polymer
RPF：Refuse derived Paper and Plastics densified Fuel. Made from used paper and waste plastics, materials that are difficult to recycle out of industrial waste

Flow of horizontal recycling of pulp through water solubilisation/separation/ozonation

Members and their roles

Unicharm Corporation	Establishment and commercialisation of a recycling system for used disposable diapers
Shibushi City and Osaki Town	Collection of used disposable diapers
Soo Recycling Center Co., Ltd.	Installation, operation and management of recycling equipment

Future outlook We aim to work with 10 municipalities by 2030.

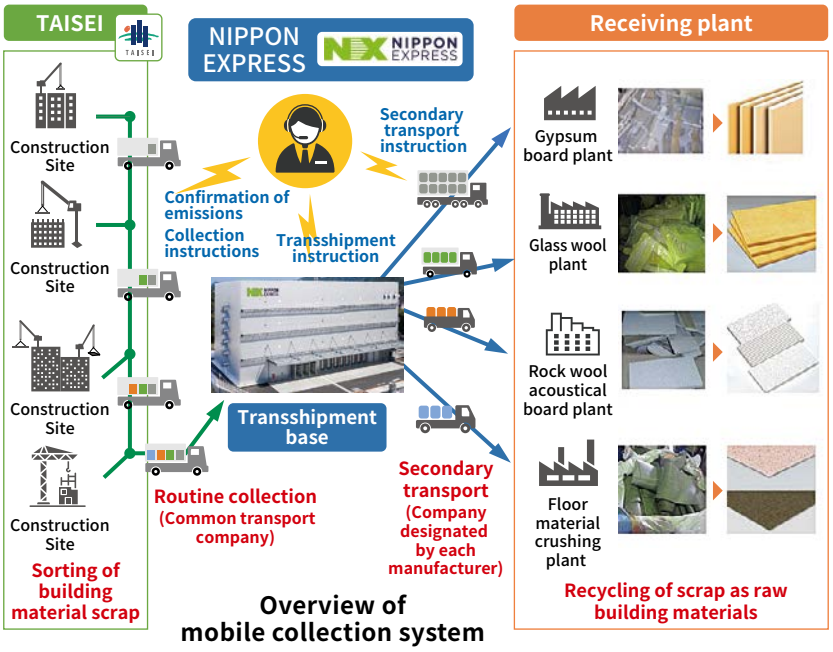
Case 07. By-product of construction mobile collection system using wide-area certification system

Summary and key points of the initiative

At construction sites, building material manufacturers use a system called the wide-area certification system to recycle non-combustible building material scraps such as gypsum boards and glass wool that are difficult to recycle. However the transportation costs of transporting small amounts of scraps over long distances have been an issue.

TAISEI CORPORATION has therefore collaborated with NIPPON EXPRESS CO., LTD. , which handles logistics, and by using a unique integrated logistics system, has consolidated collection and achieved recycling through more efficient transportation. The following measures for consolidation are being taken in this initiative.

- **Standardisation of manufacturer-designated transport companies:** A common transport company that can collect scrap materials from different manufacturers with the same vehicle will be added to the designated transport companies of each manufacturer responsible for mobile collection, and operations will be standardised.
- **Consolidation of individual arrangements: NIPPON EXPRESS CO., LTD.** has built a system in which the same vehicle of a common transport company can travel to multiple sites, efficiently collecting scrap materials using dedicated collection containers, and unloading them at multiple processing destinations.
- **Cooperation between upstream and downstream entities:** When the building material delivery vehicle makes a return trip from the factory, it transports scrap material from the transfer base.



Overview of mobile collection system

Members and their roles

TAISEI CORPORATION	Sorting and quantity management of non-combustible building material scraps
NIPPON EXPRESS CO., LTD.	Gauges how much scrap material is at the site and monitors whether the processing destination can accept the material, as well as carrying out mobile collection, and transporting materials to the transfer base.
NIPPON EXPRESS's Logistics Center	Replacement base. Sorting and accumulation by manufacturer
Secondary transport company	Transfer to delivery vehicles at the receiving factory, transport from the transfer point to the receiving factory (partially handled by NIPPON EXPRESS CO., LTD.)
Receiving factory	Recycling scraps as building materials

Effects of the initiative

> 1,694 tonnes of non-combustible building material scraps (1,036 tonnes certified as wide-area scraps, 658 tonnes as valuable materials) (as of September 2020) were collected and fully recycled

> This not only reduced processing costs, but also reduced landfill disposal volume and fuel consumption

Future outlook

- As an open initiative that can be joined by other companies in the same industry, we are working to realise a circular economy for the entire construction industry.
- We aim to achieve a modal shift[7], further efficiency and decarbonisation, and expand the scope of application.

7 Shifting from cargo transportation carried out by automobiles such as trucks, and making more use of railways and ships, which have a lower environmental impact.

Case 08. Accelerating resource circulation (3R) and decarbonisation at construction sites using a digital platform

Summary and key points of the initiative

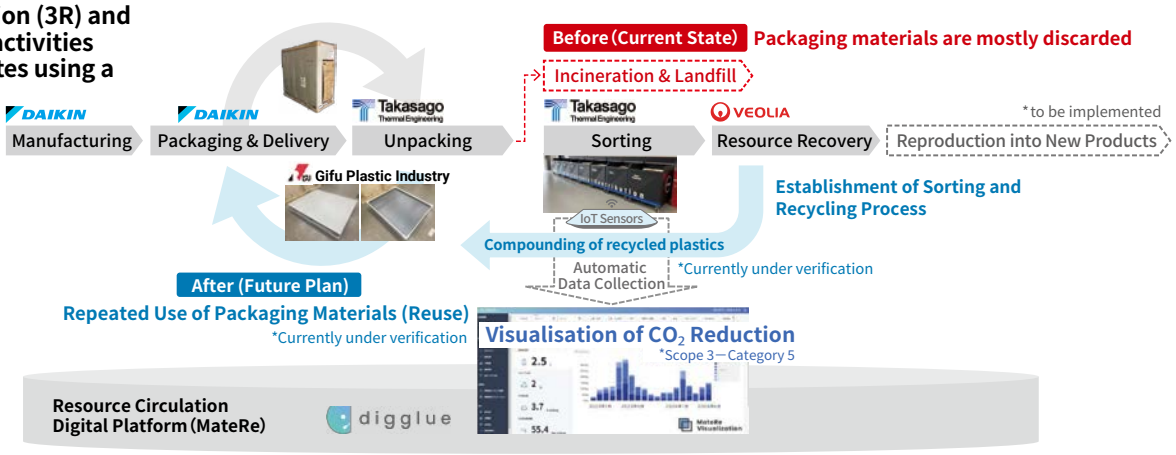
In order to simultaneously advance the circular economy and decarbonisation at construction sites, it is essential to understand the information on plastic waste and the amount of CO_2 reduction achieved through recycling and remanufacturing.

In this context, digglue Inc., a provider of collaborative management services, is using a digital platform (MateRe-Visualization) that automatically visualises and accumulates this information to digitally connect arterial companies, in collaboration with Takasago Thermal Chemical Industry Co., Ltd., which carries out equipment construction in the construction industry, and Daikin Industries, Ltd., an air conditioner manufacturer, as well as with the venous companies, Veolia Genets Co., Ltd., which crushes and pelletises waste plastic, and Gifu Plastic Industry Co., Ltd., which designs and manufactures products using recycled plastic. This initiative aims to become a pioneering model to ensure cooperation between upstream and downstream entities that combines real and digital worlds.

This initiative was adopted in July 2022 by the Tokyo Metropolitan Government Bureau of Environment's "Innovative Technology and Business Promotion Project". Using IoT weighing scales, data for a range of plastic materials (5 categories: PS, PE, PVC, PP, PET) is automatically collected and compiled, and the optimal sorting method for recycling is established. This sorting method is then conveyed to on-site staff, volume reduction equipment is introduced, and venous companies are developed as partners. In addition, a system has been established that can calculate CO_2 emissions and reductions as well as recycling rates by inputting not only the weight of each plastic material but also the processing method (incineration, recycling, etc.) and transportation distance.

Currently, with the aim of making air conditioner packaging returnable, we are verifying the commercialisation of new packaging materials that combine environmental friendliness with practicality and durability.

Resource circulation (3R) and decarbonisation activities at construction sites using a digital platform



Members and their roles

Takasago Thermal Engineering Co., Ltd.	As a construction company in the construction industry, we plan and execute the 3Rs for waste plastic, and promote the use of digital platforms
Daikin Industries, Ltd.	As an air conditioner manufacturer, we plan and consider reusable packaging materials
Veolia Genets Co., Ltd.	As a recycling company, we crush and pelletise waste plastic
Gifu Plastic Industry Co., Ltd.	As a remanufacturing manufacturer, we design and manufacture products that contain recycled plastics
digglue Co., Ltd.	Development and provision of digital platforms, as well as research, analysis and activity reports

Future outlook

Going forward, we will take on the following initiatives to improve resource circulation at construction sites.

- Reduce waste from packaging materials, and establish and expand the manufacturing and operation process of returnable packaging materials for that purpose.
- Establish and expand the recycling process for waste plastics, complying with regulations such as the Waste Management and Public Cleansing Act.
- Establish and expand a waste plastic collection scheme, including traffic cones, from construction sites nationwide.
- Produce prototypes and evaluate and verify horizontal recycling from packaging material to packaging material.

Case 09. Demonstration test on recycling waste glass from construction sites

Summary and key points of the initiative

Waste glass from construction sites, such as demolition and renovation sites, is a material that can be recycled, but due to reasons such as economical construction and transportation methods, and quality control methods for recycled glass, most of it is not recycled at present. In addition, some glass raw materials are imported, which has high CO_2 emissions during the manufacturing and transportation of raw materials.

Therefore, two companies, TAISEI CORPORATION (construction company), with its track record of many demolition and renovation works, and AGC Inc. (manufacturer), which manufactures and transports glass products, collaborated to conduct a demonstration test to create a “resource circulation loop that recycles waste glass between construction sites.” Specifically, the companies considered methods for removing waste glass so that it can be reused, and methods for quality control of waste glass to ensure its quality as a glass material.

Calculations of CO_2 emissions from this demonstration test showed that for every tonne of recycled material used instead of virgin material, CO_2 emissions from the mining, transportation and glass manufacturing processes can be reduced by approximately 0.6 tonnes. This is expected to reduce industrial waste emissions (14.3 tonnes) and raw material usage (17.2 tonnes).

Members and their roles

TAISEI CORPORATION	Removal of waste sheet glass, transportation from the site to AGC Inc.’s plant
AGC Inc.	Evaluation of suitability of waste sheet glass as glass material (laboratory test, actual test), production of recycled sheet glass

Effects of the initiative

14.3 tonnes of waste sheet glass collected from demolition sites were used as raw material to produce recycled sheet glass, and it was confirmed that there was no impact on the quality of the product or the manufacturing equipment.

- Amount of waste sheet glass material removed (recovered): 14.3 tonnes
- Amount of recycled material (resource) (rate): 14.3 tonnes (100%)
- Amount of product using recycled material (product) (rate): 14.3 tonnes (100%)
- Amount of CO_2 reduction (estimated value): 8.6t-CO_2 (SCOPE 1—3 from raw material procurement to glass production)

Future outlook

We aim to promote the sustainable recycling of waste sheet glass, work to resolve issues identified through the initiative, and promote a circular economy throughout the construction industry.

Case 10. Circulation Platform "De Owarasenai PLATFORM"

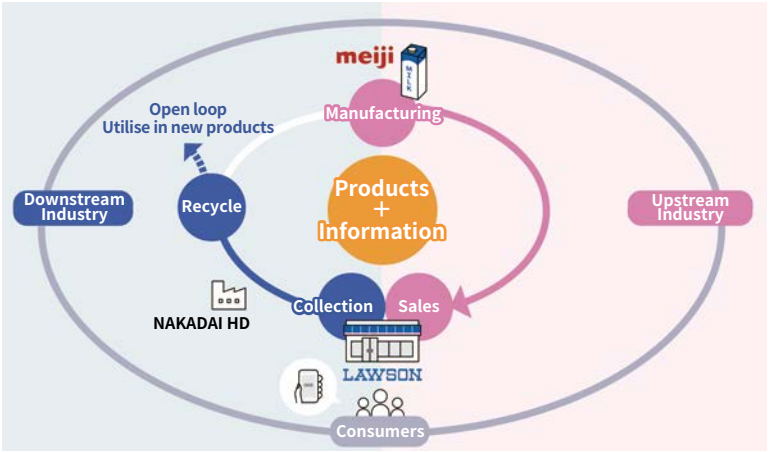
Summary and key points of the initiative

In order to promote the circular economy in concrete terms, it is essential to have not only collaboration between different industries, but also to change the consciousness and behaviour of consumers, such as recycling used items and purchasing products with recycling in mind.

DENTSU INC. and DENTSU PROMOTION PLUS INC. have developed a digital platform that promotes collection and recycling activities from a marketing perspective, and have collaborated with companies that can participate in experiments that digitally connect manufacturers, distributors, recyclers and consumers. Using this platform, demonstration experiments are conducted to confirm and identify consumer awareness and behavioural change when collecting and recycling items, as well as looking at effective sales promotion.

Specifically, at three Lawson convenience stores that serve as collection centres, a system has been developed in which consumers can register the JAN code of the paper-packaged beverage product they purchased from their smartphone, and then receive a discount coupon for "Meiji Oishii Gyunyu" by dropping the empty container into a collection box at the store.

A demonstration experiment was conducted to see how adding an incentive in the form of a discount coupon would change consumer awareness and behaviour in terms of encouraging them to participate in container collection and simultaneously promoting new purchases. DX enabled the tallying of collected items by type and amount, the profitability of creating a sales lead, and the quantifiable change in consumer awareness and behaviour. This multi-company joint collection platform is expected to reduce costs and streamline operations, as well as improve the efficiency of recycling by separating and collecting different types of materials.



Members and their roles

Meiji Co., Ltd.	Product manufacturing and sales, provision of discount coupons
LAWSON, INC.	Sales and installation of resource recycling boxes
NAKADAI Holdings Co., Ltd.	Recycling system and network construction for collected items
DENTSU INC.	Planning and design, verification of experimental results
DENTSU PROMOTION PLUS INC.	System development and implementation

Effects of the initiative

Main effects of the demonstration project:

- Recycling rate of paper cartons: 99% (1% is incinerated).
- CO_2 reduction effect: Carbon footprint reduced by 1.514 [kg-CO_2] [8]
- High coupon redemption rate: 16.2% [9]

Future outlook

The following initiatives are being considered by expanding the types of items to be collected, broadening the scale, and lengthening the period of operation.

- Expanding the range of collected items and collection locations
- Utilising recycled materials and ensuring traceability
- Providing individually optimised incentives to continuously encourage consumer participation

8 In a demonstration experiment, we compared a case where paper cartons were recycled and a case where they were incinerated. Although most of the collected materials can be recycled as materials, there are also food-grade materials that have been mixed in as foreign matter. Plastic bags and paper waste are incinerated.

9 Exceeded the average redemption rate of approximately 10% when implementing digital coupon campaigns for beverage products.

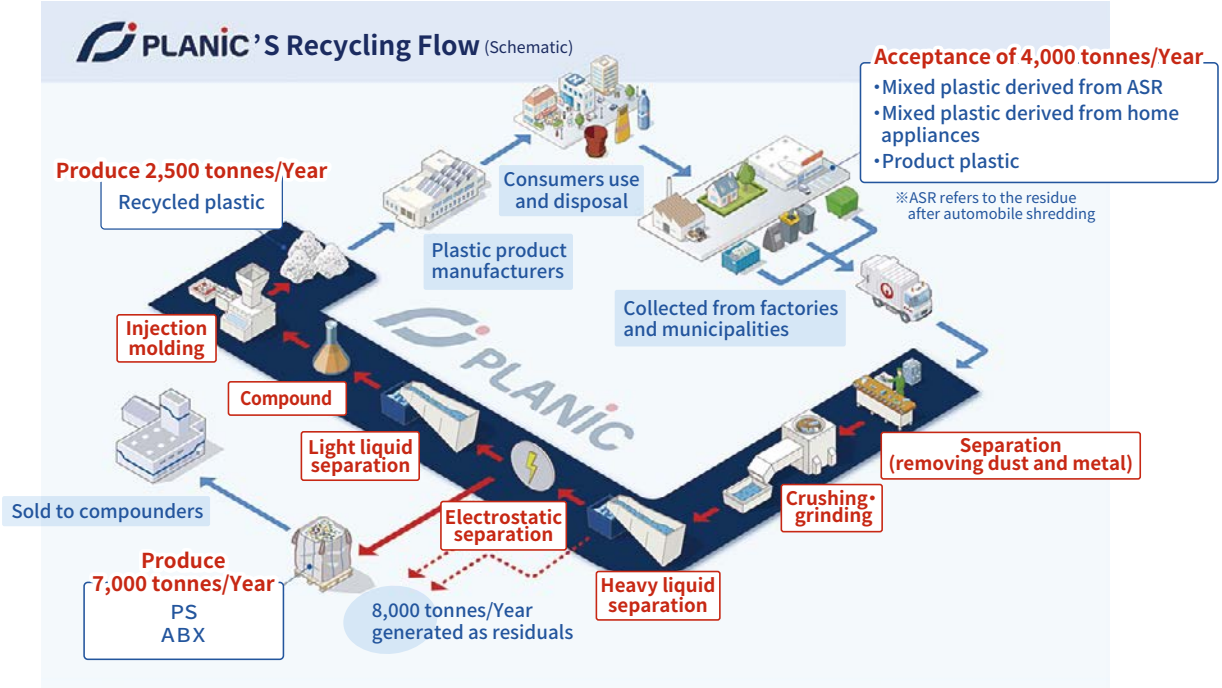
Case 11. Achieving car-to-car recycling from plastic derived from scrapped automobiles

Summary and key points of the initiative

Mixed plastics recovered from scrapped automobiles, scrapped home appliances, used pallets and containers, etc., contain a variety of different properties, making it difficult to separate them by material.

K.K. Planic whose shareholders are Toyota Tsusho Corporation, which is responsible for procuring raw materials and selling recycled materials, and Kojima Sangyo Co., Ltd., which is responsible for developing recycled materials for automobiles, was established in December 2018 as one of Japan's largest recycled plastic manufacturers, sorting and compounding mixed plastics recovered from recycling facilities, etc., and recycling them as plastic raw materials. The company has been operating its Omaezaki Plant since October 2022.

K.K. Planic promotes the recycling of collected mixed plastics into automobiles, home appliances, pallets, etc. by using Japan's first advanced specific gravity sorting technology, and is contributing to resource circulation and reduction of CO_2 emissions in the automobile industry by promoting the reuse of plastics derived from scrapped automobiles into automobile parts.



Members and their roles

K.K. Planic	Joint venture company between Toyota Tsusho Co., Ltd. and Kojima Sangyo Co., Ltd. Sorting and compounding waste plastic
Toyota Tsusho Co., Ltd.	Procurement of raw materials, sales of recycled materials, and management support
Kojima Sangyo Co., Ltd.	Technical support for manufacturing recycled materials for automobiles

Future outlook

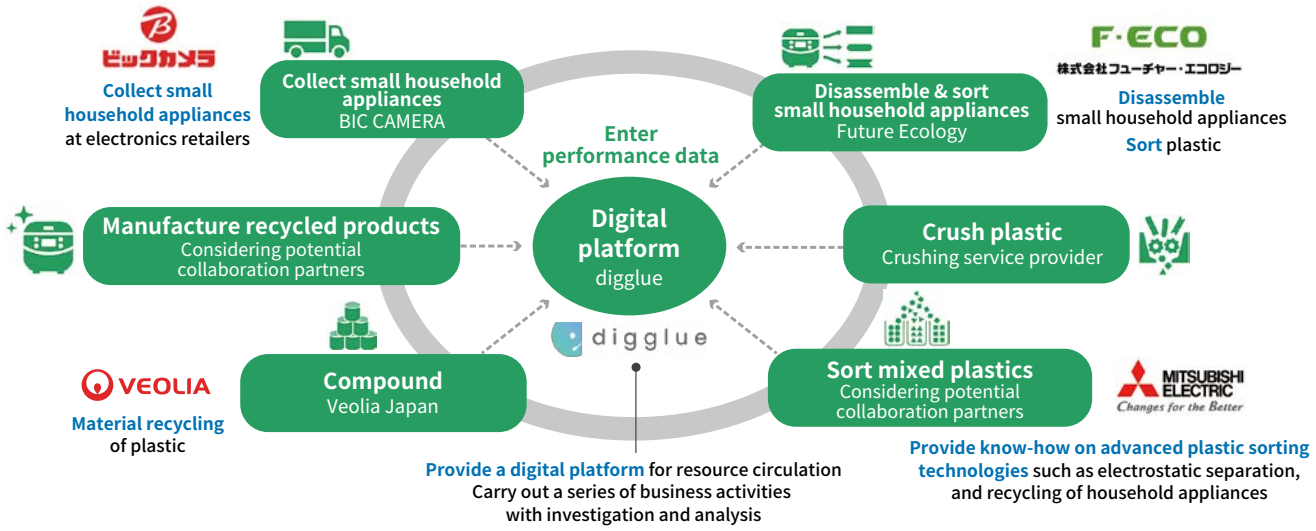
K.K. Planic will promote the recycling of approximately 40,000 tonnes of plastic generated annually from automobiles, home appliances, etc. In particular, there has been a strong demand from customers related to the automobile industry, and it is expected that the supply of recycled resin from K.K. Planic to automobile-related customers will increase.

Case 12. Accelerating the recycling of waste plastics from small home appliances

Summary and key points of the initiative

Currently, approximately 80% of waste plastic from small home appliances is processed by combustion, including heat recovery, which emits large amounts of CO_2, so there is a need to switch to resource circulation with lower CO_2 emissions.

In this context, through a public recruitment project by the Tokyo Metropolitan Government, upstream and downstream companies that are active in resource circulation jointly established a series of resource circulation processes from collection and dismantling of small home appliances to remanufacturing, and launched a demonstration project targeting rice cookers. One of the team members, digglue Inc., which provides digital technology such as visualisation of collection volume, shared collection and recycling volumes in real time, making it possible to verify the intermediate processing process in the series of recycling flows from collection to recycling.



Members and their roles

Bic Camera Co., Ltd.	Collection of small home appliances
Future Ecology Co., Ltd.	Dismantling and sorting of small home appliances
Crushing company	Crushing of small home appliances
Mitsubishi Electric Co., Ltd.	Providing plastic sorting technology
Veolia Japan Co., Ltd. and Veolia Genets Co., Ltd.	Recycled plastic compounding
digglue Co., Ltd.	Providing digital platform
Tokyo Metropolitan Government	Support for demonstration project

Effects of the initiative

> A total of 557 units from 20 manufacturers were collected, of which 133 units (600 kg) were dismantled by hand. After analysing the weight of each type of plastic and the dismantling time, it was confirmed that in order to make the project profitable, it is important to improve the efficiency of dismantling work and the productivity of advanced sorting machines for recycled plastics.

> It has been confirmed that the weight ratio of polypropylene (PP) in the total can be increased from 85.4% to 96.3% by using Mitsubishi Electric Corporation's electrostatic separation technology.

Future outlook

- We are considering building a system that can verify the effectiveness of public awareness campaigns and measures aimed at increasing the amount of collection.
- We are working on building a collaborative system with manufacturers of mechanical disassembly equipment and remanufacturing companies that purchase and use recycled plastics.

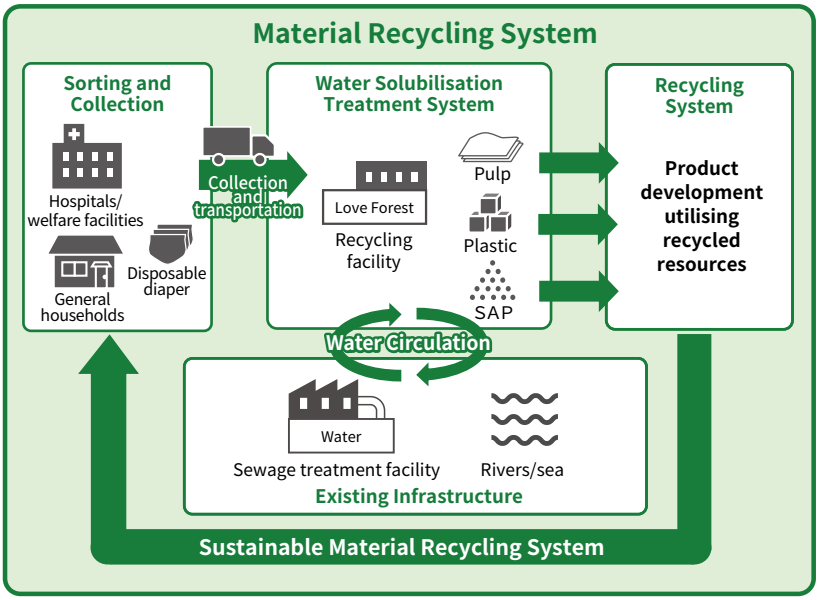
Case 13. Material recycling system for disposable diapers

Summary and key points of the initiative

Disposable diapers, which are made of composite materials such as plastic and pulp, are classified as waste plastic after use and incinerated, and have been considered unsuitable for recycling until now.

The materials that can be recovered from used disposable diapers are pulp, plastic, superabsorbent polymer (SAP)[10] and dehydrated sludge. Of these, Total Care System Co., Ltd. provides recycled pulp, which is of the same quality as virgin pulp, as a valuable building material, and Toppan Corporation has developed technology to use plastic as a raw material for plastic products and regenerated SAP for use as a material for pet litter box lining sheets, etc. In the future, a system that "recycles all constituent materials" in pursuit of resource circulation is planned to be developed.

The diaper recycling system is a system that functions by integrating the three systems of "separate collection", "water solubilisation treatment", and "recycling"



Members and their roles

TOPPAN Co., Ltd.	Process control, application development, utilisation and sales for optimal upcycling of recycled resources
Total Care System Co., Ltd.	Providing recycling technology and know-how for used disposable diapers
Sumitomo Heavy Industries Environment Co., Ltd.	Plant design and construction of water-soluble treatment equipment
Oki-cho, Miyama City, Chikuzen-cho, Mizuma-gun, Fukuoka Prefecture	Separate collection

Effects of the initiative

> Currently, we recycle over 5,000 tonnes of used disposable diapers per year from medical institutions, welfare facilities and ordinary households in surrounding municipalities

> By recycling used disposable diapers without incineration, CO_2 emissions are reduced by approximately 37%

> Omuta Plant performance:

- Collection volume: 5,000 tonnes, 70% (3,500 tonnes) is sewage
- Recycling volume (rate): 1,350 tonnes (90%): Percentage of 1,500 tonnes of disposable diapers
- Remanufactured volume (pulp): 500 tonnes (working to remanufacture plastic and SAP)
- Incineration and landfill reduction: 5,000 tonnes = collected volume
- CO_2 reduction (rate): Approximately 500 kg-CO_2eq/t per tonne of used disposable diapers

Future outlook

The company has begun considering a business model for a used disposable diaper recycling system that can be introduced to many municipalities, with the aim of commercialising the system and having municipalities adopt it from FY2022 onwards.

10 A water-absorbing material made of polymer that absorbs hundreds of times its own weight in water.

Case 14. Chemical recycling of acrylic resin —The beauty of transparent resin circulates with carbon—

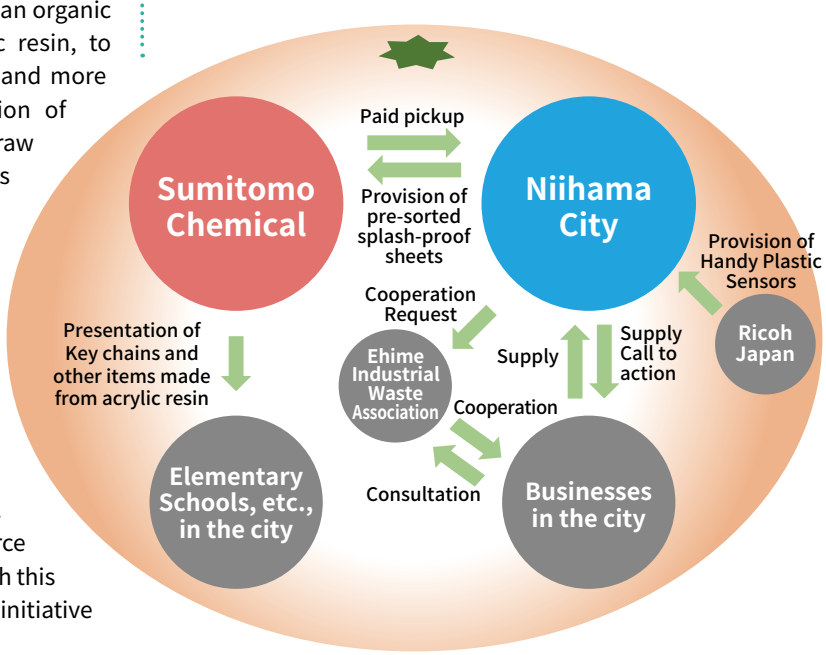
Summary and key points of the initiative

Acrylic sheets (panels to prevent the dispersion of airborne droplets) to prevent the spread of the COVID-19 virus have been used for a wide range of purposes, including restaurants, and businesses and local governments have been faced with new challenges, such as how to dispose of and store them.

In response to this situation, Sumitomo Chemical Co., Ltd. has jointly developed with Japan Steel Works, which has the technology to decompose used acrylic resin into MMA monomer (methyl methacrylate monomer), an organic compound that is the raw material for acrylic resin, to establish a unique basic technology that safely and more efficiently proceeds with thermal decomposition of used acrylic resin and regenerates it into the raw material MMA monomer. On a lab scale, it has been confirmed that recycled monomers can be obtained with a high recovery rate from used acrylic resin and that it can be recycled into acrylic resin of the same quality as virgin materials. Since December 2022, a chemical recycling demonstration facility for acrylic resin (PMMA, polymethyl methacrylate) has been in operation and demonstration experiments are being conducted.

At the same time, Sumitomo Chemical Co., Ltd. and Niihama City have launched a local resource circulation project for these acrylic sheets. Through this initiative, they are promoting “Circular Action,” an initiative that brings together businesses, citizens, local governments and others to realise a recycling-oriented society.

As a result of this collaboration between the three parties, a resource recycling system has been established that collects the panels to prevent the dispersion of airborne droplets (used acrylic resin) that are no longer needed by restaurants and other businesses in the city, and recycles and manufactures them.



Members and their roles

Japan Steel Works, Ltd.	Provides continuous plastic decomposition technology using the twin-screw extruder “TEX” developed in 1997
Sumitomo Chemical Co., Ltd.	Provides knowledge of methyl methacrylate (MMA) monomer and acrylic resin (PMMA) that has been cultivated over many years
Niihama City, Ehime Prefecture	Called on restaurants and other businesses in the city to donate unwanted acrylic sheets, and collected them with the cooperation of the Ehime Industrial Resource Recycling Association

Effects of the initiative

The recycled MMA monomer has the same quality as materials made from fossil resources, and we have confirmed that it can reduce GHG emissions over the entire product life cycle by more than 60% compared to conventional products

Future outlook

By establishing this technology, we will brand acrylic resin with outstanding transparency as Meguri® products and promote their widespread use.

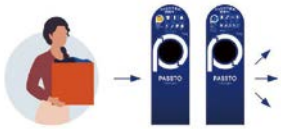
Case 15. PASSTO, a resource recycling service that collects, sorts and redistributes unwanted items in an integrated manner to realise a circular economy

Summary and key points of the initiative

One challenge to expanding the circular economy is the lack of infrastructure for “circulating” things, in contrast to the infrastructure for “throwing things away”. To solve this problem, ECOMMIT Co., Ltd. and other companies and facilities involved in the collection, sorting and redistribution of unwanted clothing, miscellaneous goods, hobby supplies, etc. have joined forces to establish the original brand “PASSTO,” which does this all in one place.

PASSTO is an amalgamation of PASS and TO, meaning to “pass on to the next person, connect to the future.” It serves as gateway to resource recycling in places close to consumers, “collecting” unwanted items that are no longer in use, “sorting” them for optimal use, and creating a cycle of “reusing and recycling” to put them to good use again. The flow from collection to redistribution also utilizes digital technology to ensure traceability. In addition, ECOMMIT redistributes the collected unwanted items domestically and internationally as reused items, and works with recycling partners such as ITOCHU Corporation Textile Company, which provides horizontal recycling technology for items that are difficult to reuse, thereby enabling the recycling of clothing that cannot be reused.

Items are passed on to the next destination



Items are sorted through PASSTO and redistributed for reuse or recycling

Reuse
Items are redistributed back to the market to maintain economical & material value while narrowing the product loop

Closed-Loop Recycling
Items are recycled back to raw materials to manufacture new product

Cascade Recycling
Items are downcycled to manufacture alternative products to prolong its material longevity

Members and their roles

ECOMMIT Co., Ltd.	Operation of resource circulation service “PASSTO”
ITOCHU Corporation Textile Company	Manufacture of recycled polyester
Commercial facilities (AEON Saga Yamato store, etc.)	Provision of PASSTO collection points at commercial facilities
Condominiums/residences	Provision of PASSTO collection points at condominiums
Local governments	Provision of PASSTO collection points at public facilities, etc.

Effects of the initiative

- There are approximately 4,000 collection points, including post offices, shopping centres and residences. The total amount of all items collected is 12,000 tonnes/year (data for 2019). One worker sorts 1,000 kg per day.
- We work with over 100 domestic and overseas redistribution destinations, and have achieved redistribution for 80 different sorting categories based on redistribution packages.
- The average reuse and recycling rate for textile products 98%, and by prioritising reuse, we have reduced the environmental impact.
- Compared to the CO_2 emissions generated when collected clothing is simply incinerated, we have achieved a 72.2% reduction in CO_2 emissions (however, this varies depending on the case).

Future outlook
We aim to collect approximately 50,000 tonnes, which is 10% of the total amount of discarded clothing in Japan, by 2026, and are working to establish and expand a circular economy in Japan.

Case 16. Demonstration experiment to promote reuse by Mercari, Yakult Sanyo, Akitakata City, and Miyoshi City

Summary and key points of the initiative

There are a number of issues associated with establishing a culture of reuse, such as the personnel expenses required for it to operate and the allocation of space for storing items after they are collected.

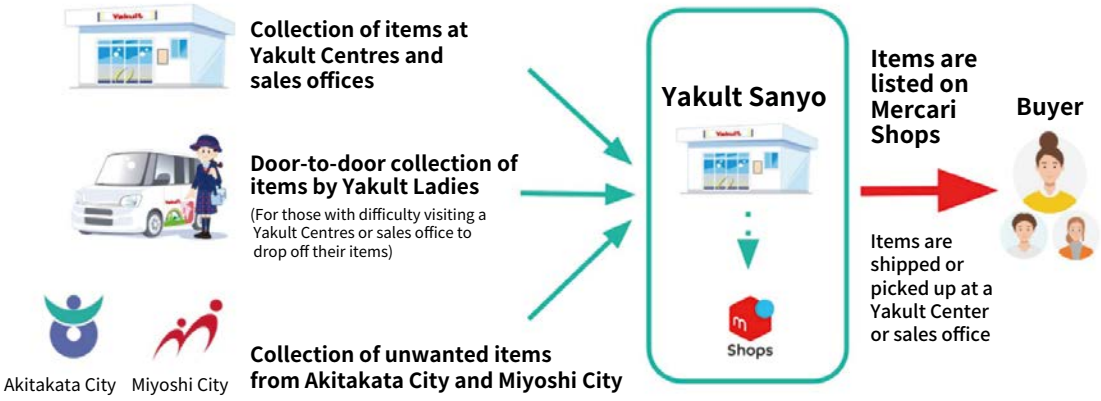
To address these issues, Yakult Sanyo Corporation and Mercari, Inc. partnered with the cities of Akitakata and Miyoshi, making use of Yakult Sanyo Corporation's delivery systems and sales offices tied closely to the community and Mercari's e-commerce platform to list unwanted items that can still be used. Under the partnership, Yakult Sanyo Corporation and the two local governments collect unwanted items that can still be used and list them for sale on *Mercari Shops*. The project, started as a proof of concept in June 2024, is scheduled to run until March 2025. Essentially, Yakult Centers and sales offices are used as sales locations for unwanted items that are collected and then sold on *Mercari Shops*.

This project reduces the burden that local governments shoulder associated with collecting unwanted items, aiming to further the circulation of reused items within the local area.

For local governments, this project reduces the volume of garbage and allows the community to make further progress in establishing a regional culture of reuse; for Yakult Sanyo Corporation, it introduces a new service centered around reuse while making use of existing resources. The project is also expected to have strong synergy with existing businesses as it contributes to revitalising local communities, making a positive impact on the environment, and creating another touchpoint with Yakult Sanyo customers.

The sales proceeds from the sale of unwanted items that the local governments collect are used to contribute to the community in partnerships between local government and welfare groups. In addition, the profits fund activities to improve civic services.

The effectiveness of the proof of concept will be evaluated at a later date. Project coordinators anticipate seeing such things as enhanced awareness of reuse within the community as well as a reduction of greenhouse gas emissions through the reuse of items.



Members and their roles

Mercari, Inc.	Provides *Mercari Shops* which allows Yakult Sanyo to list unwanted items easily.
Yakult Sanyo Co., Ltd.	Provides a network with its Yakult Centers, sales offices, and "Yakult Ladies" who visit people's homes to deliver Yakult products. This network allows the community to efficiently collect residents' unwanted items and sell them on Yakult Sanyo's *Mercari Shops* account.
Local governments (Akitakata City and Miyoshi City, Hiroshima Prefecture)	Receive and sort oversized garbage that is transported to local government offices. (Akitakata City Hall facilitates the provision of unwanted items that can still be used.)

Future outlook

- The businesses and local governments involved in this project would like it to become a model for circulating resources and promoting reuse among local communities. By creating an example for other companies and local governments to refer to, we aim to foster stronger collaboration between the public and private sectors to reduce waste and achieve a circular economy together.
- Mercari collaborates with the University of Tokyo's Research Institute for an Inclusive Society through Engineering (RIISE) via the Value Exchange Engineering Research Program. The partnership also involves calculating the extent to which the project's promotion of reusing items contributes to curbing greenhouse gases.

Case 17. Contribution to efficient resource utilisation through remote tyre pressure monitoring service

Summary and key points of the initiative

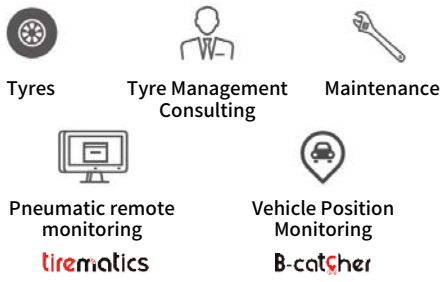
The logistics and transportation industry faces various challenges such as driver shortages, ageing among drivers, rising prices, and requirements for decarbonisation measures. Additionally, there is an urgent need to ensure safe operations while simultaneously improving operational efficiency and reducing environmental impacts. According to the 2019 tyre inspection results of the Japan Automobile Tyre Manufacturers Association, it was confirmed that approximately one in five trucks had poor tyre maintenance and approximately one in three of those had low tyre pressure at the time of truck inspection.

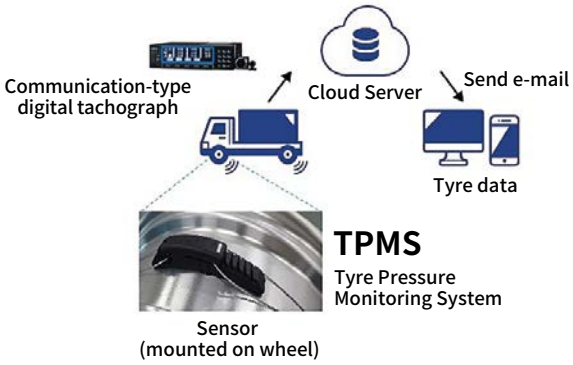
In order to contribute to solving these issues faced by transportation companies, Bridgestone Corporation, which deals with tyres, and its partner companies that deal with communication equipment, have collaborated to develop "Tirematics Real-time Monitoring," a service that leverages mutual strengths to effectively make use of resources (tyres), as well as providing continuous remote monitoring of tyre pressure and temperature. Communication equipment companies are improving the added value of digital tachographs, while Bridgestone is notifying drivers and operation managers of tyre conditions in a timely manner, enabling prompt maintenance. This service is offered as an option to the "Total Package Plan (TPP)" for tyres, maintenance, etc.

By utilising TPP including Tirematics, we are increasing opportunities to reuse tyres as retread tyres, and contributing to the reduction of environmental impacts by efficiently using up tyres, improving fuel efficiency, and reducing CO_2 emissions.

TPP Total Package Plan — A subscription plan that combines the following menus depending on customers' needs

tirematics — A solution tool that provides tyre air pressure data from sensors installed inside tyres with transportation companies through Bridgestone's cloud server





Members and their roles

Bridgestone Corporation, Bridgestone Tire Solutions Japan Co., Ltd.	Planning, developing and providing solution services that combine tyre sales, maintenance, remote monitoring, etc.
TRANSTRON Inc., Yazaki Energy System Corporation	Developing functions for the above services through digital tachographs and building information and communication systems

Effects of the initiative

Before the introduction of TPP, 91% of customers had tyre pressure below the appropriate value, but after the introduction of TPP, the number of customers with improper tyre pressure improved to 28% (according to Bridgestone).

Future outlook We are developing further functions such as early detection to reduce the environmental impact caused by low tyre pressure (effective use of resources, reduction of CO_2 emissions).

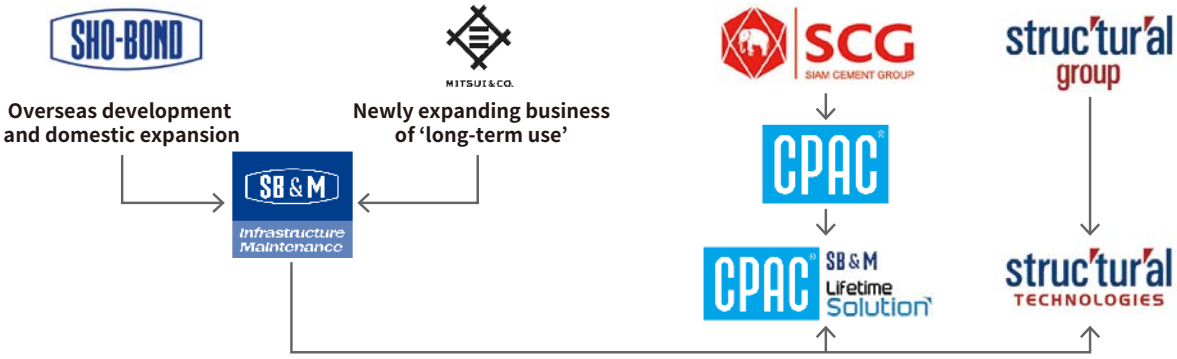
Case 18. Extending the lifespan of infrastructure through maintenance

Summary and key points of the initiative

In recent years, the deterioration of infrastructure such as roads, railways, ports and buildings has become a social issue around the world, and there is a growing need to extend the lifespan of infrastructure through repairs and reinforcement, as well as preventive maintenance.

In this context, SHO-BOND Holdings Co., Ltd., which specialises in the repair and reinforcement of infrastructure since its founding, and Mitsui & Co., Ltd., which has a global network and extensive know-how in managing overseas businesses, jointly established SHO-BOND & MIT Infrastructure Maintenance Co., Ltd. (SB&M) in 2019. In 2020, SB&M established a joint venture, CPAC SB&M Lifetime Solution Co., Ltd. (CPAC SB&M), with CPAC, a subsidiary of major conglomerate Siam Cement Group, in Thailand to provide repair services. In addition, in 2023, the company invested in Structural Technologies, LLC (ST), a US infrastructure repair company, and provides repair and reinforcement services, mainly for buildings and bridges, by introducing Japanese technology according to customer needs.

The Mitsui & Co. Group has established a policy of working to mitigate climate change through a maintenance approach, based on the recognition that extending the lifespan of infrastructure contributes to reducing CO_2 emissions. Under this policy, the group is collaborating through joint ventures and investments to deploy Japanese technology for the maintenance of infrastructure overseas, while leveraging the strengths of partner companies. This is not only an approach for corporate growth, but also a way to contribute to creating a circular economy and reducing CO_2 emissions around the world by utilising Japan's technology and knowledge, and further developments are expected in the future.



Members and their roles

SHO-BOND & MIT Infrastructure Maintenance Co., Ltd. (SB&M)	Joint venture company between Mitsui & Co. and SHO-BOND Holdings, Design and consulting services for civil engineering and construction works in Japan and overseas, advisory services such as construction technology guidance, development, manufacture and sale of civil engineering and construction machinery, equipment and products
CPAC SB&M Lifetime Solution Co., Ltd	Joint venture company between CPAC, a subsidiary of Siam Cement Group in Thailand, and SB&M Developing structural maintenance business for roads, bridges, railways, ports and buildings in Thailand
Structural Technologies, LLC	Joint venture company between SGI in US and SB&M Delivering repair and reinforcement services, mainly for buildings and bridges, by introducing Japanese technology according to customer needs

Effects of the initiative

While extending the lifespan of existing infrastructure and also strengthening it through maintenance, it also has the effect of reducing CO_2 emissions* compared to new construction.

Future outlook

In the infrastructure industry in particular, rules differ from country to country and region to region, and national character and business practices have a significant impact, so we are working with our partners in Thailand and the United States to customise Japanese styles to suit the local needs and solve social issues.

* According to the SHO-BOND Holdings Integrated Report 2022, it was calculated that there was a 9.2-fold difference in CO_2 emissions between discarding and replacing the Showa Bridge, which was damaged in the 1964 Niigata Earthquake, and repairing the bridge

See J4CE Website for detail initiatives
j4ce.env.go.jp/en

J4CE
JAPAN PARTNERSHIP FOR CIRCULAR ECONOMY

Founding organisations

環境省
Ministry of the Environment

METI
Ministry of Economy, Trade and Industry

Keidanren
Japan Business Federation

J4CE Secretariat
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IGES
Institute for Global Environmental Strategies