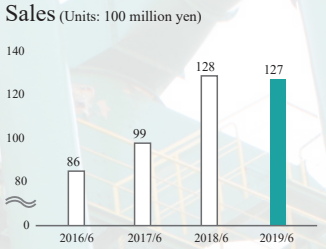
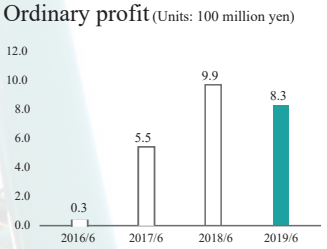
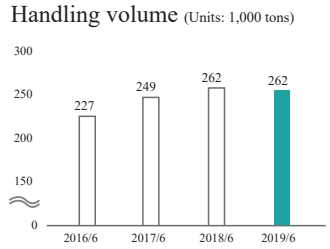
Resource Circulation Business

Resource Circulation Business that enhances the sustainability of a society

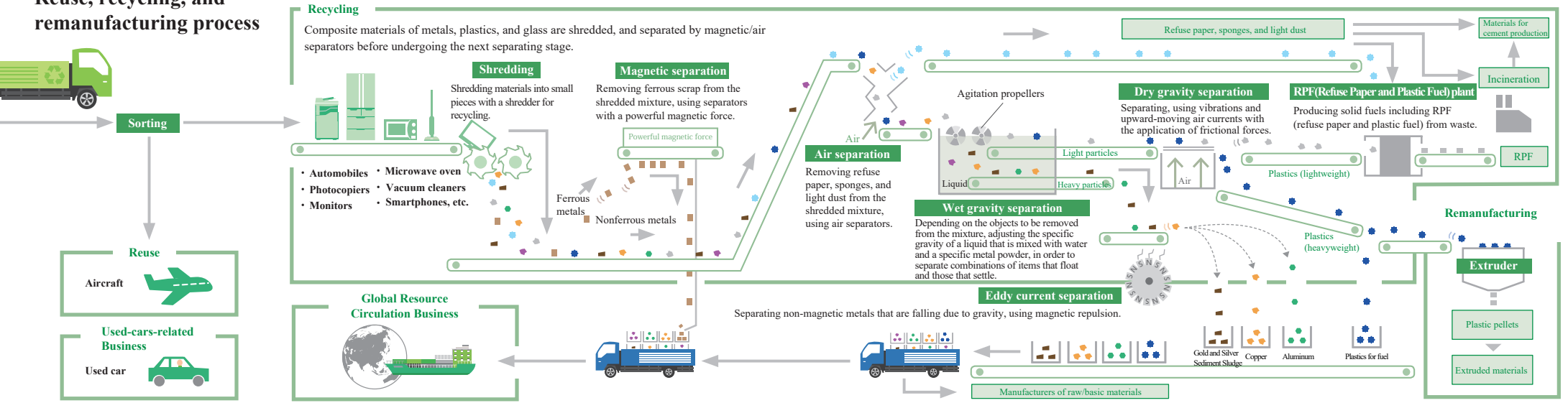
Population explosions and the development of developing countries have increased resource consumption across the world. Continuous resource consumption will cause depletion and generate enormous levels of waste, creating environmental problems such as waste plastics flowing into the sea, which is becoming increasingly serious. It has been arousing concerns about the sustainability of a society.
The ENVIPRO Group promotes the resource circulation business as our key business to achieve our mission statement that is to "contribute to create a sustainable society." We offer new value to society, engaging in the effective utilization of limited resources, waste reduction, and the production of recycled raw materials from waste, by promoting the reuse, recycling, and remanufacturing of materials that were disposed of as waste.







Reuse, recycling, and remanufacturing process



Three key businesses

The ENVIPRO Group operates the resource circulation business, focusing on the following three businesses as its key components.

1. Recycling Business (resource recovery)

Our group has been engaged for more than half a century in a recycling business in which metal scrap, waste and others are crushed, and physically sorted into ferrous and nonferrous metals, gold, silver, and copper sediment sludge(mixed metals), plastics, etc. based on differences in their properties. With the use of advanced sorting technologies based on the above-mentioned technologies as well as our accumulated know-how, it is possible to condense and collect ultrafine precious metal particles from both waste incineration ash and ASR* that seemingly contain no precious metals. Furthermore, with regard to waste plastics, we have achieved a recycling rate of approximately 97.6%, minimizing simple incineration and landfilling by producing RPF for thermal recycling.

*ASR: Abbreviation of Automobile Shredder Residue. The residue which remains after end-of-use vehicles are dismantled and shredded to remove chlorofluorocarbons and their parts, such as air bags, doors, and engines, and to collect useful metals.

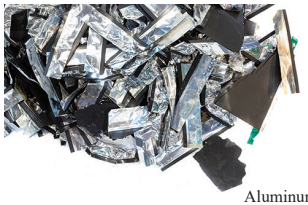
2. Remanufacturing Business (re-production)

Our group promotes and actively invests in the “Remanufacturing Business” which aims to manufacture recycled raw materials out of waste and scrap by taking recycling technologies to the next level. We are engaged in manufacturing recycled resin pellets from waste plastics, rubber chips from waste tire rubber, and recycled cobalt and nickel materials from lithium-ion batteries.

To become a manufacturer of recycled raw materials for products, we must maintain product quality, fabricate prototypes, ensure a stable product supply, guarantee delivery schedules, and others. We need to have totally different viewpoints in order to develop technologies and business know-how from the recycling businesses. We are now taking up these new challenges.

3. Reuse Business (reuse)

We are engaged in a reuse business that distributes used products and maintenance parts without modifying their functionality or value. The volume of metal scrap and waste will inevitably decrease in Japan where more people share goods and products, and where the population is declining. Therefore, for our group which is engaged in the resource circulation business based on these materials, our involvement in the reuse business is important from the viewpoint of securing materials for our key businesses.


Aluminum


Stainless


RPF


Gold and Silver Sediment Sludge

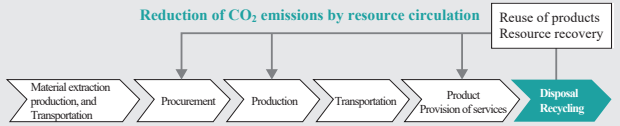
Topics

CO_2 reduction throughout the product lifecycle

To realize a sustainable society requires the efficient utilization of not only material resources, such as mineral resources, but also energy. Most materials, including steel and plastic products, which are currently distributed throughout society, are made from natural resources such as iron ore, petroleum, etc. The manufacturing processes for these materials consume vast amounts of energy.

Our group promotes the dissemination of materials produced from waste through the resource circulation business which is engaged in the sorting/collection of iron from metal scrap and the development/manufacturing of recycled pellets from waste plastics. In turn, we contribute to reducing the amount of energy use and CO_2 emissions throughout the product lifecycle including the procurement of raw materials.

Resource circulation of product materials contributes to the reduction of CO_2 emissions throughout the product lifecycle



Resource Circulation Business

Collection of precious metals from waste incineration ash (riddling ash)

Undertakings to collect metals from so-called “urban mines,” such as scrap cars and disposed home appliances, have been gradually recognized in society since the Act on Promotion of Recycling of Small Waste Electrical and Electronic Equipment was put into effect. Nevertheless, a significant proportion of waste incineration ash that contains a large quantity of metals is still landfilled without being recycled, although some is recycled as materials for cement production. Based on our research and accomplishments over the years, we have successfully developed the technology to collect precious metals from waste incineration ash discharged by general waste disposal facilities, for which we obtained a patent in May 2019. Through the application of this technology, we have not only improved the recycling rate of waste/precious metals but also contributed to reducing the landfilling of waste incineration ash.

Volume of waste incineration ash collected

Approx. **2,008** tons
(FY2018)

Volume of precious metals collected from waste incineration ash

Au (gold)
Approx. **22.7** kg

Ag (silver)
Approx. **162.5** kg

Purchase history from municipalities: collection of precious metals from riddling ash

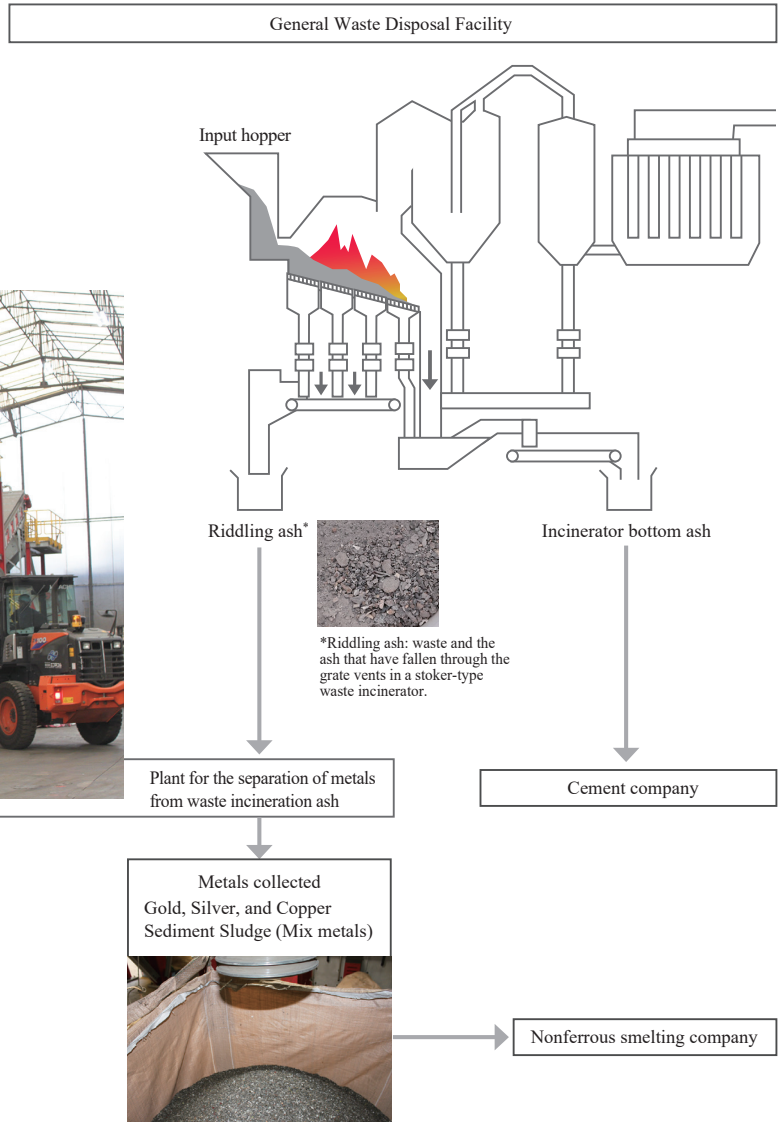
Riddling ash generated during waste incineration generally has a high metal content, which can be collected as valuables without modifying their properties. ECONECOL Inc. concluded agreements with three municipalities* for the purchase of riddling ash as of June 2019. By expanding this undertaking to other municipalities across the country, we will contribute to the effective use of resources and the reduction of landfilling.

* Three municipalities: Inzai District Environmental Service Association (Chiba), Tottori Chubu Furusato Wide-area Federation (Tottori), and Tama Newtown Environment Association (Tokyo)

Joint venture with Taiheiyo Cement Corporation: recycling of incinerator bottom ash

Compared with riddling ash, the ash collected from the bottoms of incinerators has a low metal content and is considered difficult to recycle. ECONECOL Inc. has engaged in a joint venture with Taiheiyo Cement Corporation, aiming to collect precious metals from incinerator bottom ash and to recycle the ash after the precious metals are removed in order to produce materials for cement production. We have installed equipment for verification tests in the Ofunato Plant of Taiheiyo Cement and are currently undertaking the tests in collaboration with REVER HOLDINGS CORPORATION, in preparation for commercializing this technology.

Metal collection process from waste incineration ash (riddling ash)



Resource Circulation Business

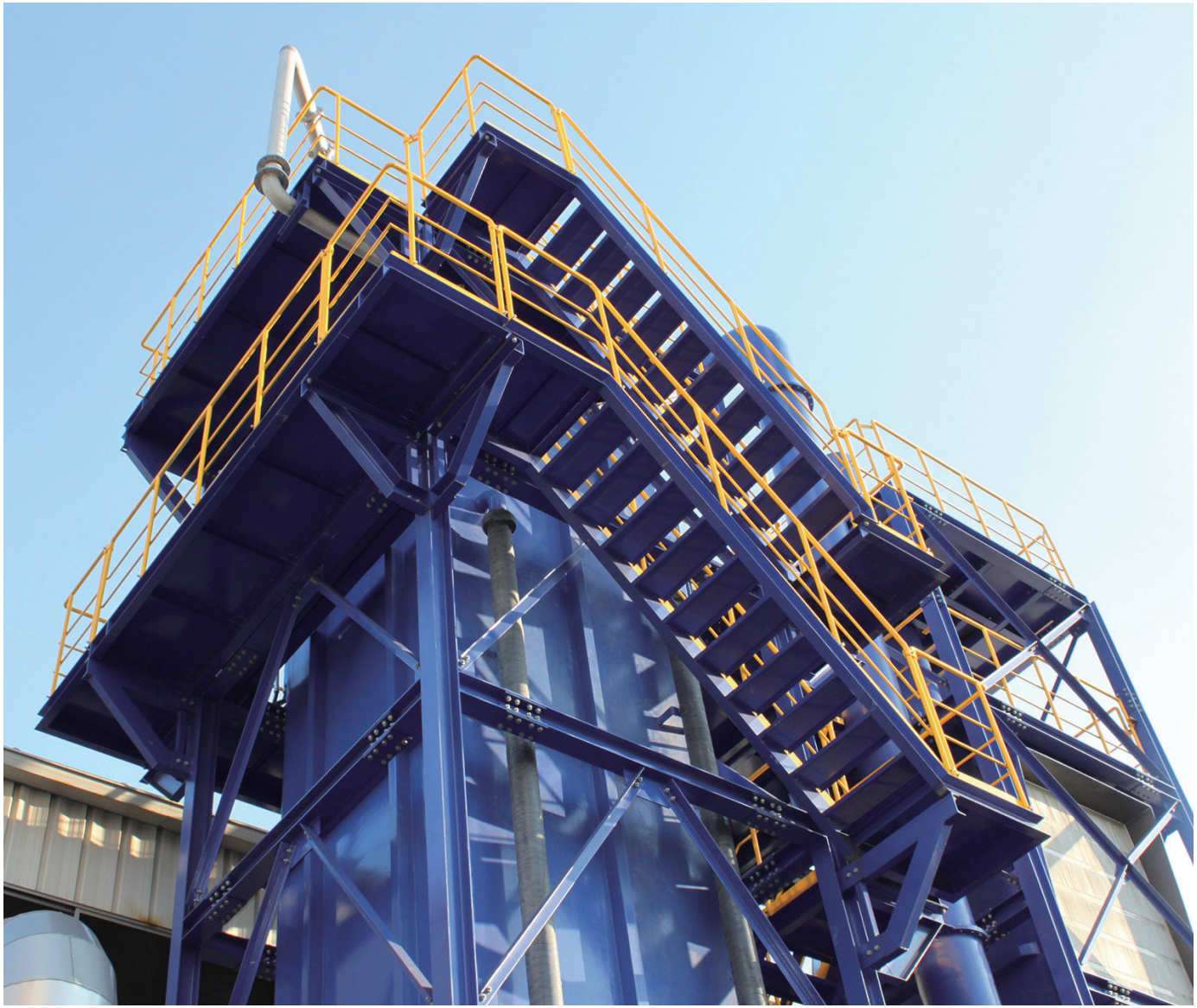
Recycling of lithium-ion batteries

Minor metals such as nickel and cobalt are known as the “vitamins of industry” because these metal materials are indispensable to the high-tech and electronic industries. However, the depletion of materials is now causing great concern because the expansion of relevant industries has been increasing the demand for minor metals. VOLTA Inc. focused its attention on particularly the inputs of lithium-ion batteries, and is currently engaged in the recycling of minor metals (cobalt, nickel, and lithium) that are used in lithium-ion batteries. Lithium-ion batteries are widely used in home appliances, such as smartphones and electric cars, and the demand is expected to further grow in the future. The company contributes to the realization of a sustainable society, promoting resource circulation by supplying the collected minor metals back to battery manufacturers.

In FY2018, the company made a large investment to ensure the safe discharge of electricity and to create a system for prompt recycling. Furthermore, it constructed a factory equipped with a unique exhaust treatment system in order to enhance the safety of residents and the neighborhood environment. We will strive to promote lithium-ion battery recycling and to improve the recovery rates by further promoting technological innovation in the future.

Black sand

* Black sand: a mixture of cobalt, nickel, and others that is produced by the calcination of lithium-ion batteries. By smelting Black sand, recycled cobalt and nickel are produced.



Resource Circulation Business

Recycling of ASR

ASR Recycling Business

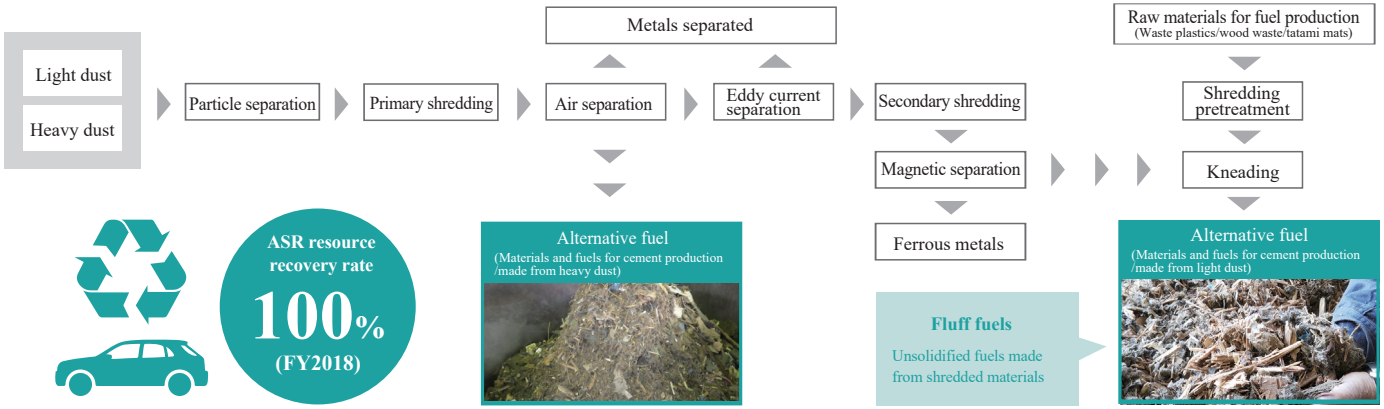
KURODA RECYCLE Co., Ltd. is engaged in the recycling business of Automobile Shredder Residue (ASR), which remains after end-of-use vehicles are dismantled to remove chlorofluorocarbons and their parts, such as air bags, doors and engines, and shredded to collect useful metals.
ASR contains metal particles that were not collected during the shredding process. By further separating/pulverizing and kneading ASR, the company successfully collects the metal particles and recycles them as materials for cement production, thereby contributing to improving the recycling rates of scrap cars.
There are only a small number of ASR recycling facilities nationwide. Hence, the company's facility in Hakodate City, Hokkaido, accepts ASR from outside of Hokkaido.

ASR Recycling Facility

Dealing with wood waste/materials that are difficult to dispose

Demand is expected to increase for disposal of wood waste generated through demolition of buildings. In light of this, the company constructed an additional pulverizing plant to increase the volume of wood waste to be recycled as fuel chips, etc.
Furthermore, this plant accepts materials that can be neither shredded nor crushed, such as fishing equipment, which causes disposal problems for people in the fishing industry. The company will proactively increase the number of accepted products, including materials that are difficult to dispose, thereby expanding the range of products which they can recycle.

ASR Recycling Facility: Flowchart



Topics

Resolution of waste management problems inherent in each community

The company is located in the seaport town, Hakodate City. It works on resolving waste management problems inherent in Southern Hokkaido through the "Comfortable Life Support*" business. In recent years, it has focused on the management of scrapped vessels, ranging from small fishing boats that can be transported by truck as they are, to large-scale fishing vessels that need to be dismantled on site. In this business, it adopts a bracket contract. Hakodate is also a snowfall area. The company undertakes the preemptive demolition and removal of houses, backyard sheds, containers, etc. that are anticipated to collapse due to snowfall.
As described above, the company offers various services in response to the different needs of customers in local communities, making use of its extensive knowledge and experience related to recycling.

*Comfortable Life Support: a business that addresses a wide range of issues faced by local residents through, for instance, the disposal of disused articles, the removal and disposal of articles including large-sized home appliances, and the demolition of vacant houses.

Dismantling of vessels

Before garage removal

After garage removal

Resource Circulation Business

Regional circular and ecological economy through recycling

"Syn Eco Plaza Azumino," a recycling facility for regional circular and ecological economy through recycling

"Syn Eco Plaza Azumino," a recycling facility for regional circular and ecological economy through recycling

In April 2019, SYN ECO Inc. opened "Syn Eco Plaza Azumino," a recycling facility for regional circular and ecological economy through recycling. Under the theme of "solving social issues in the community," it offers a wide range of services to address the problems facing local residents using recycling as an entry point.

Recycling of disposed home appliances

Syn Eco Plaza Azumino collects and recycles home appliances (TVs, air-conditioners, washing machines and refrigerators) disposed in Azumino City.

Opening of "Comfortable Life Support" help desk

Syn Eco Plaza Azumino operates the "Comfortable Life Support" help desk for Azumino citizens, responding to the problems they are facing, including disposal of disused articles.

Permanent installation of collection boxes of reusable materials

Syn Eco Plaza Azumino is engaged in the recycling of materials brought in by local residents through the "Mottainai BOX" installed in the compound where they can deposit reusable materials 24 hours a day.

"Comfortable Life Support" to support the comfortable life of local residents

快適ライフサポート
快適な暮らしをトータルサポート

The company undertakes the "Comfortable Life Support" business in the areas around its offices. It offers a variety of services such as moving of furniture and home appliances, disposal of disused articles, removal/disposal of large-sized home appliances, arrangement of the belongings of the deceased by concerned specialists, demolition of vacant houses, and cleaning of houses, thereby contributing to solving social issues in the community such as assisting the elderly with waste disposal/house cleanup and addressing vacant house problems. The total number of cases attended by our Comfortable Life Support teams reached 844 in FY2018.

RE100 Recycling Facility RE 100

In July 2019, Syn Eco Plaza Azumino installed a power generating facility with reused solar panels placed on the roof. Syn Eco Plaza Azumino obtains 100% of the electricity that it consumes in the facility from renewable sources, by combining its self-generated solar power with the electricity purchased from an electricity retailer under the "RE100 Menu."

Aerial view of "Syn Eco Plaza Azumino"

Resource Circulation Business

Regulatory Sandbox Framework

Collecting resources through “Mottainai BOX”

SYN ECO Inc. has permanently installed a “Mottainai BOX” in the Chushin region of Nagano where people can leave reusable materials 24 hours a day. It recycles cardboard boxes, newspapers, wastepaper, used clothes, metals etc. It has collected a total of 5,214 tons of materials since its start.

Mottainai BOX

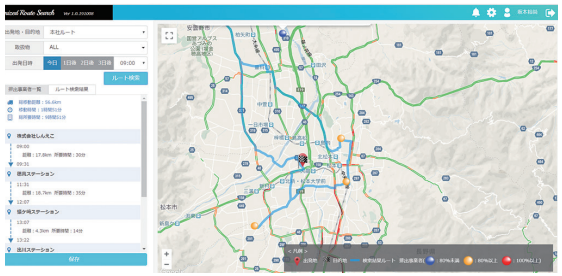
First project approved by the Ministry of the Environment under the “Regulatory Sandbox Framework” -Demonstrating a next-generation wide-area recycling system which uses IoT-

The company has been undertaking a demonstration project for a next-generation wide-area recycling system which uses IoT, aiming to enhance the utilization of “Mottainai BOX.” The project is approved by the Minister of the Environment.
While society demands the reduction of CO_2 emissions during waste incineration, a significant proportion of materials disposed by households, such as wastepaper, used clothes and metals have been landfilled or incinerated as waste while they could have been recycled. In addition, although municipalities should reduce their expenditure for waste management as the population decreases, they find it difficult to reduce related operation costs, labor costs, etc. This is because, in principle, each municipality is made responsible for the collection of household waste in its own jurisdiction, making it impossible for multiple municipalities to work together in order to benefit from economies of scale.

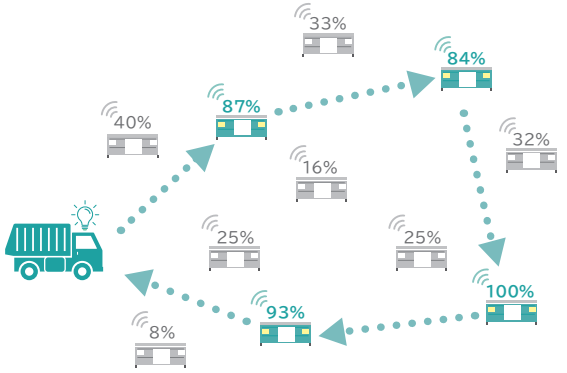
Aiming to solve such problems, the company obtained approval from the Ministry of the Environment, the first of this kind under the “Regulatory Sandbox Framework*,” to install the “Mottainai BOX” in 13 municipalities across the Chushin region, Nagano. This is in addition to those that have already been installed in Matsumoto City and Azumino City. By using IoT to manage the boxes that are installed across a wide area, the company has efficiently collected materials and improved recycling rates.

*Regulatory Sandbox Framework: This system is aimed at reviewing regulations that potentially pose difficulties for the commercialization of new technologies, such as IoT, blockchain, or robots, or the realization of new business models such as platform businesses or the sharing economy. Under the system, business operators who wish to promote new technologies or business models in society will submit an application and obtain approval from the competent Minister in charge before conducting a demonstration test. Then, the information and data collected through the demonstration test will be utilized to review the regulations. (Source: Prime Minister’s Office: Growth Strategy Portal Site)

Collection BOX management system using IoT



Managing collection boxes installed across a wide area with IoT



Identifying the optimal collection route

Resource collection system

Resource Circulation Business

Remanufacturing (re-production) Business

Material recycling from ASR to plastics

Automobile shredder residue (ASR), which remains at the end of the recycling process, is recycled as solid fuels and materials for cement production. However, a significant proportion of residue is incinerated and landfilled due to various problems including the treatment capacity of recipient companies. ASR contains a large volume of plastics. Recycling such plastics will have great social significance from the viewpoints of promoting ASR recycling as well as the material recycling of plastics.

PLA 2 PLA Inc. manufactures plastic granular pellets with a diameter of 5 mm by separating and processing recycled plastics from ASR. Recycled plastic pellets are currently used as recycled raw materials for new plastic products such as pallets, which are utilized in the distribution industry. The company has been engaged in research to expand the use of recycled plastics in cooperation with an automobile company, aiming to construct a resource circular model for vehicles (from one car to another car) in the future.

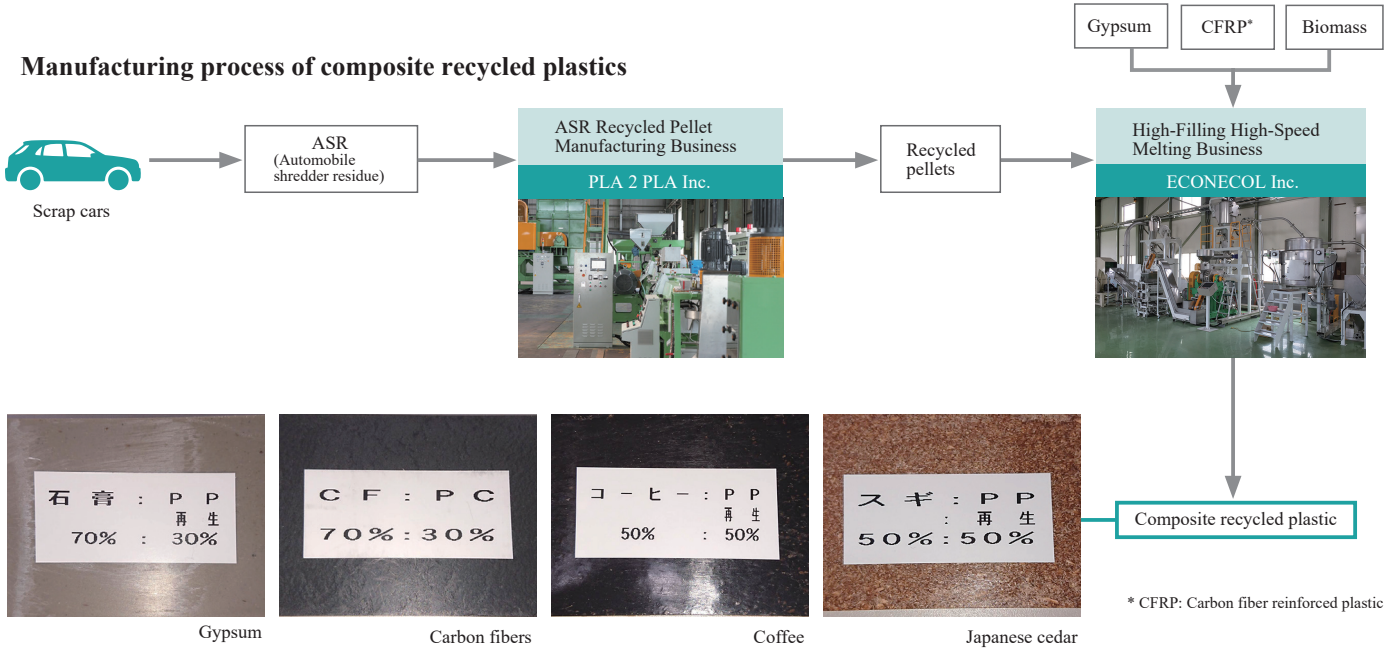
Furthermore, it is working on the development of “bioplastics” by mixing recycled plastic pellets with biomass such as wood powder. This work is jointly undertaken with ECONECOL Inc. which is engaged in the business to mix plastics using a high-filling high-speed melting machine, demonstrating the synergy that exists among group companies.

Manufacturing of recycled plastic pellets

Development of new recycled materials by melting and fusing different materials together

It is still difficult to recycle plastics and carbon fibers, which are manufactured and disposed in massive quantities. Relevant recycling technologies have not been well developed and, even if they are recycled, their use has still been limited. ECONECOL Inc. has introduced a new technology to mix two different materials that an ordinary kneader finds difficult to mix such as recycled plastics and Japanese cedar, recycled plastics and carbon fibers, and recycled plastics and gypsum. It has launched the manufacture of mixtures with the properties of few thermal hysteresis which cause little damage, and has been collaborating with the manufacturers of basic materials and molding equipment to expand the use of recycled raw materials.

Manufacturing process of composite recycled plastics



* CFRP: Carbon fiber reinforced plastic

Taking on challenges to manufacture biomass plastics

The high-filling high-speed melting machine that ECONECOL Inc. has introduced is capable of mixing plastics, etc. with biomass, such as wood chips, with a biomass content of 50% or more. It has been verified to have the technical characteristics suitable for the manufacturing of biomass plastics. The company is currently engaged in the development of recycled plastics by melting and fusing plastics with various materials. There is enormous potential for the production of composite recycled plastics.

Resource Circulation Business

Manufacturing recycled materials from waste rubber

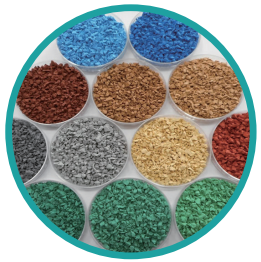
Taking over and advancing technologies

TOYO RUBBER CHIP Co., Ltd. founded in the Meiji era, has been involved in the rubber recycling business since 1942. It makes full use of the skills and knowledge it has gained over 80 years to manufacture products.
Regarding waste tires and offcuts of industrial rubber products as precious resources, it manufactures rubber powder from these materials. This recycled powder is widely used for elastic paving materials and artificial turf infills, as well as industrial products such as tires and brake linings. The company is determined to develop new materials by making use of the technologies that it has cultivated.

Rubber recycling process

Scrap tires
(Offcuts of rubber products from factories, etc.)

Black rubber mulch



Synthetic rubber
(EPDM)
* EPDM: Ethylene Propylene Diene Rubber

Color rubber chips

Enhancing safety in the community and ensuring a “joyful” environment for children

Black rubber mulch, one of the recycled materials, is used for the cushioning of artificial turf for football fields, etc., ensuring the safety of people who enjoy sports. Furthermore, “Omni rubber RailGuard panels,” railroad crossing rubber panels, have great elasticity/durability along with corrosion resistance and a nonskid-surface, thereby helping to reduce the number of railroad crossing accidents.
Color rubber chips made from synthetic rubber are used for parks, pavements and the flooring of play equipment as high-quality cushioning with great elasticity. It is possible to create an original design, by combining the various colors. Furthermore, they help reduce the risks that involve fatal injuries caused by stumbling or falling.


Football field


Railroad crossing rubber panel


Shunsuke Park


Rubber panels for pedestrians


Maebashi Children Park


Kids Pia Ashikaga


Day care center


Kids Park

Topics

“RE100” Rubber Chip Factory

On May 1, 2019, the factory of TOYO RUBBER CHIP Co., Ltd. became an “RE100 Factory” where 100% of the electricity consumed is generated from renewable sources. The electricity consumed by the factory is purchased from electricity retailers under the “RE100 Menu.” Moreover, with the use of the non-fossil fuel energy certificate with tracking information, the factory will get prioritized to receive electricity from the Komiya Solar Power Plant owned by SYN ECO Inc., one of our group companies.
As a result, the company has achieved CO_2 emission reductions in the manufacturing process, making it possible to produce zero emission products.