Resource Circulation Business

Flow of Treatment/Processing in the Resource Circulation Business

INPUT
Above-ground resources (waste)

- Ferrous scrap
- Automobiles
- Electronic circuit boards
- Small home appliances
- Riddling ash*1
- Plastics
- Tires

Separation

RECYCLING

Shredding
Materials are finely shredded for recycling.
- Automobiles
- Photocopiers
- Microwave ovens
- Vacuum cleaners
- Smartphones, etc.

Magnetic separation
Ferrous scrap is removed from the shredded mixture using strong magnetic force.
Ferrous metals
Nonferrous metals

Air separation
Paper waste, sponges, and light dust are removed from the shredded mixture using air separators.
Paper waste, sponges, light dust, and lightweight plastics

Dry specific gravity separation
Waste is sorted by using vibration and upward air flow.
Agitation propellers
Air power
Light particles
Heavy particles
Liquid

Wet specific gravity separation
The specific gravity of a liquid that combines water and a specific metal powder is adjusted according to the items to be extracted, separating items into those that float and those that settle.
Ferrous metals

Eddy current separation
Falling non-magnetic metals are sorted using magnetic repulsion.

Refuse paper and plastic fuel (RPF) plant
RPF and other solid fuel are produced from waste.
RPF
Materials for cement production
Incineration

REUSE
- Airplanes
- Used cars

GLOBAL TRADING
Export overseas
Materials manufacturers
Aluminum
Copper
Gold, silver, and copper sediment sludge
Plastics for fuel

REMANUFACTURING
Extruder
Plastic pellets
Extruded materials

OUTPUT
Recreating resource value

- Shredded steel scrap
- Copper
- Aluminum
- Gold, silver, and copper sediment sludge*2
- Plastics for fuel
- RPF (solid fuel)*3
- Rubber chips

*1 Riddling ash is ash that falls through the grate of a stoker furnace when waste is incinerated.
*2 Gold, silver, and copper sediment sludge is a mixture of gold, silver, copper, platinum, and palladium.
*3 RPF, which stands for "Refuse derived paper and plastics densified Fuel," is a high-grade solid fuel made mainly from recovered paper and plastics (mainly from industrial waste) that are difficult to recycle as materials.

Resource Circulation Business

Recycling Innovator eCONeCOL

ECONECOL Inc.

Business
- Recycling of resources using large shredders
- Collection of gold, silver, and copper sediment sludge from incineration ash
- Manufacture of low-carbon raw materials and fuels
- Cleaning and dismantling work
- Reuse and recycling of aircraft

For more detailed company information

Value & Vision

Contributing to a Sustainable Society by Circulating High-Quality Low-Carbon Raw Materials and Fuels through Society

**ECONECOL Inc. was established in 1950 in the city of Fujinomiya, Shizuoka Prefecture.
Since that time, the company has been involved in the Resource Circulation Business, focusing on the recycling of metals, plastics, and waste materials.
A parent organization of the ENVIPRO Group, ECONECOL leads the recycling industry in the spirit of pursuing opportunities to reduce wastefulness.**

RE100 CLIMATE GROUP | CDP

Running the Plant on Electric Power from Renewable Sources

ECONECOL is working toward RE100, an initiative that calls for companies to procure 100% of the electricity required for their business operations from renewable energy sources. The company is already using 100% of electric power from renewable sources at its head office plant and Hamamatsu plants. ▷P32
These plants recycle materials into environmentally friendly, low-carbon raw materials and fuels for use around the world.

Reinforcing the Wood Biomass Business

In March 2022, ECONECOL absorbed Fujimi BMS Co., Ltd., reinforcing the business of providing a stable and sustainable supply of wood chips, which are used as boiler fuel.
Wood waste comes in many categories, primarily from trees, construction, and wooden pallets. This wood waste can be thermally recycled. Through material recycling, these types of wood waste can also be transformed into chips for paper manufacturing or raw materials for medium-density fiberboard (MDF).

Products made from recycled wood waste

Business of Collection Gold, Silver, and Copper Sediment Sludge from Urban Mines

The Tokyo Olympics held in 2021 showcased an experiment in “urban mining,” in which medals distributed to the winning athletes were made from recycled materials. While much attention has been paid to the value of waste

Comment

Our Mission: Contribute to create a sustainable society

Fumikatsu Sano, Representative Director ECONECOL Inc.

ECONECOL conducts resource recycling. We focus on the Resource Circulation Business, which is in keeping with the Group’s mission “Contribute to create a sustainable society” In addition to general ferrous and nonferrous metals, we recycle precious metals and minor metals. We combine various sorting technologies into our own proprietary techniques for recycling valuable resources. We cooperate with product manufacturers to promote a circular economy in which product, consumption, waste recycling, and manufacturing flows lead to materials that can be recycled into product materials.We believe that expanding our business model in this way will bring us closer to the aim of achieving a sustainable society.

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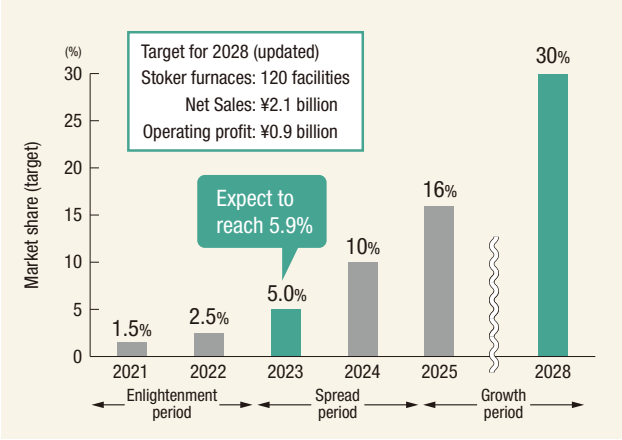
electrical and electronic products as resources, most incineration ash from municipal waste–which contains precious metals–is still disposed of in landfills. After years of research, ECONECOL has established a technology to collect precious metals from some of this incineration ash. The technology was patented in January 2019. The precious metals contained in riddling ash*1 and mixed metals are concentrated, collected, and recycled using technology that optimizes physical sorting methods. By expanding this initiative to municipalities nationwide, we also plan to help reduce the amount of waste sent to landfills.

Stoker furnaces account for the majority of Japan's general waste treatment facilities. Nationwide, Japan has around 390 facilities capable of processing more than 100 tons per day. In 2022, the final year of the Enlightenment period for this project, our operations covered 2.5% of these facilities. We regard this project as the spread period from 2023, and by 2025 we aim to reach 16% of facilities.

*1 Riddling ash is the incineration ash that falls through the grate of a stoker furnace.



Manufacturing Low-Carbon Raw Materials and Fuels (RPF) from Waste Plastics

Refuse derived paper and plastics densified fuel (RPF) is solid fuel made from waste plastics and paper waste that is difficult to recycle. An environmentally friendly fuel, RPF offers stable quality and significantly lower CO_2 emissions than coal and other fuels. We produce about 25,000 tons of RPF per year, most of which we supply on an ongoing basis to paper companies for use as boiler fuel. Our plant is currently operating around the clock, and we intend to expand production, as we plan to further increase the number of clients.

RPF

Construction of a New Plant in Fuji, Shizuoka Prefecture

In December 2021, we began construction of the Fuji plant, a new base of operations in Fuji, Shizuka Prefecture. The plant was completed in September 2022. The plant building, which is on a 13,000-square-meter site, has 6,300 square meters of floor space. Recycling equipment is steadily going into operation. The plant uses our proprietary technology for physical sorting to collect nonferrous metals, precious metals, and plastics from incineration ash, mixed metals, and waste shredder residue.

The plant will ensure high productivity and improve profitability, while providing a safe work environment that reduces employee workloads and external environmental impact.

Resource Circulation Business

Kuroda Recycling Together

Kuroda Recycle Co., Ltd.

Business
- Recycling of resources using large shredders
- Collection of gold, silver, and copper sediment sludge from incineration ash
- Manufacture of low-carbon raw materials and fuels
- Cleaning and dismantling work

For more detailed company information

Value & Vision

Helping to Realize a Sustainable Society through the Cleaning, Disposal, and Recycling of Unwanted Items

**We are developing a community-based recycling business in southern Hokkaido, centered on the city of Hakodate.
August 2022 marked the company's 100th anniversary of establishment. We are actively involved in dismantling work, as well as the disposal of large items, such as automobiles and wind power generation equipment.**

RE100 CLIMATE GROUP | CDP

Providing a One-Stop Service for Dismantling Work

Kuroda Recycle Co., Ltd. provides a one-stop service for dismantling work, including the cleanup of debris from buildings and grounds, preliminary investigation of asbestos-containing building materials, CFC collection, and building dismantling work. The company's centralized management improves work efficiency and reduces costs for the customer.
The company provides service throughout Hokkaido and is helping to resolve the issue of vacant houses. These have become a social issue in Japan due to a shrinking population, falling birthrate, and aging society.


Estimating and cleaning


Preliminary survey of building materials for asbestos content



Dismantling work

Collection Gold, Silver, and Copper Sediment Sludge from ASR and Manufacturing Low-Carbon Raw Materials and Fuels

Kuroda Recycle recycles automobile shredder residue (ASR), which is produced by shredding end-of-life vehicles. The company runs an ASR recycling facility that operates under ministerial authorization. ASR contains metals that cannot be collected by shredding and sorting processes. We collect small metals (gold, silver, and copper sediment sludge) by utilizing various approaches, such as sorting by particle size and using magnetic force, wind power, and eddy currents. After gold, silver, and copper sediment sludge is collected from ASR, the remainder is blended with other waste plastics and converted into fluff*1. We provide fluff to cement manufacturers, which use it as a fuel alternative to coal.
We will continue working to improve the recycling rate for end-of-life vehicles. In particular, we will focus on research to make our sorting technology more sophisticated and increase processing efficiency.


Alternative fuel


ASR recycling plant

Wind and Solar Power Recycling

Hokkaido has many locations suitable for wind power generation, and numerous generation facilities are in place in the region. Among these facilities, many have deteriorated after reaching the end of their 20-year useful life and are being removed. Kuroda Recycle is using its well-equipped processing facilities to recycle the large waste objects that result (ferrous scrap, special metals, and other materials).
Many wind turbines will be constructed offshore in the future. Kuroda Recycle will utilize its freight forwarders to actively accept objects from across Hokkaido to marine routes throughout Japan.


Wind power generation facility

Comment

A Direct Relation between Our Work and Carbon Neutrality

Koji Nara, Representative Director Kuroda Recycle Co., Ltd.

We handle a wide variety of waste, including end-of-life vehicles and home appliances. We also focus on dealing with the "dust" that remains after resources have been collected through the shredding and sorting processes. The resulting substance is a fuel alternative to coal. We supply this fuel to cement companies to help them in their decarbonization initiatives. Also, our production processes are powered by 100% renewable energy sources. We will continue to promote the recycling of waste materials to meet society's demands.

*1 Fluff (a recycled product of plastic containers and packaging) is what remains when these containers and packaging are finely cut after washing, removal of foreign matter, and drying.

Resource Circulation Business

SYN ECO SYN ECO Inc.

Business
- Recycling of resources using large shredders
- Cleaning and dismantling work
- Recycling specified home appliances
- Integrated community recycling

For more detailed company information

Value & Vision

Achieving Circular and Ecological Economy with the Local Community through Recycling

SYN ECO provides a recycling business with close ties to the community. Focusing on the cities of Matsumoto and Azumino in Nagano Prefecture, the company offers a Mottainai BOX service and recycles specified home appliances. The company has obtained a new permit for compressed packaging of waste plastics and has begun the thermal recycling of plastics, using them as a fuel alternative to coal.

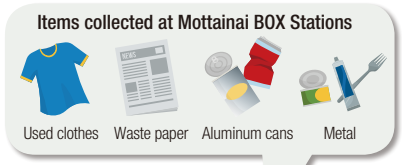
RE100 CLIMATE GROUP | CDP

Providing a Platform for Collecting Community Resources: Working Closely with the Community through Mottainai BOX Activities

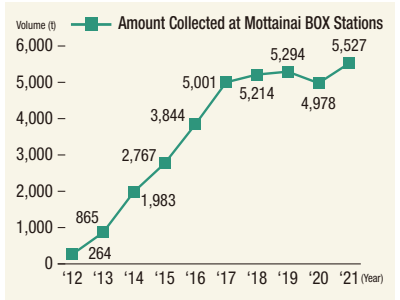
SYN ECO Inc. has set up Mottainai BOX Stations as resource collection sites at 21 locations in the Chushin district of Nagano Prefecture. In fiscal 2021, the company collected 5,500 tons of resources. The amount collected has been increasing each year as the stations grow more convenient.

On our updated website, we have begun to inform customers of our monthly collection volumes.

The company also donates a portion of the proceeds it generates from the collection of resources to the local J2 League Matsumoto Yamaga Football Club and Nagano Children's Hospital.



Mottainai BOX



Mottainai BOX characterizes the company's commitment to local production for local consumption by returning proceeds to the community from recycling resources collected locally. In addition to these activities, we support Mamafes Matsumoto activities and cooperate in events related to the reuse of children's books and other materials, as well as other activities closely related to the community. ▷P40

Using Large Shredders to Conduct High-Quality Intermediate Processing

SYN ECO is the only company in Nagano Prefecture to use a large shredder to shred and sort metals and waste plastics. Leveraging the shredder's intermediate-processing characteristics, we shred ferrous and nonferrous metals and composite waste, sell each recycled item, and help transform them into new products. The mixed metals and nonferrous metals the company processes are sorted and recycled at Group companies, maximizing Group synergies and economies of scale.

The Specified Home Appliance Recycling Business

SYN ECO is the only company in Nagano Prefecture that recycles home appliances (general waste) generated in the cities of Azumino and Nagano. When recycling specified home appliances, disassembly and sorting are done by hand, mainly by people with disabilities, so the collection efficiency of resources is high. The number of units processed and the recycling rate can be checked in real time using resource recycling monitors. The system also allows for the centralized management of incoming shipments of specified home appliances and outgoing shipments of collected resources, so the entire recycling process can be monitored.

The number of units received in the city of Nagano, where the company began operations in fiscal 2021, is increasing.

Reducing CO_2 Emitted from the Intermediate Processing of Waste Plastics

In May 2022, the company received a new permit for the compressed packaging of waste plastics. This permit opens the way to ship waste plastics, which were previously only shredded, as raw materials for RPF and other recycled fuels. SYN ECO is collaborating in this initiative with ECONECOL Inc., which produces RPF and other fuels. We anticipate that the initiative will help reduce CO_2 through the thermal recycling of plastics, using them as an alternative fuel to coal. Through the effective use of these resources, we are working toward the realization of a sustainable society.

Comment

Aiming to Be a Company Offering Integrated Community Recycling

Shigeto Komatsu, Representative Director SYN ECO Inc.

We live and work in Nagano Prefecture, a wonderful environment rich in greenery. We aim to be a company that contributes to the community through the local production and consumption of products using recycled resources generated in this region.

The Mottainai BOX resource collection service that we operate receives a large number of recyclable materials from the local community. We will continue returning some of our proceeds to local sports teams and children's hospitals.

We will continue accelerating our efforts to realize a sustainable society. Our employees will work together as we strive to create Circular and Ecological Economy.

Resource Circulation Business

Toyo Rubber Chip Co., Ltd.

Business
- Waste rubber recycling
- Manufacture and sale of recycled rubber and rubber products
- Paving work for public facilities

For more detailed company information

Value & Vision

Promoting the Remanufacturing Business, Turning Waste Rubber into New Products

Toyo Rubber Chip, which is centered in the city of Maebashi, Gunma Prefecture, is a pioneer in the recycled rubber industry. The company has been making effective use of industrial resources for 80 years. We contribute to safety and security through the development of a wide range of applications, including flooring materials for playground equipment in parks and schools, flooring materials for sports facilities, railroad crossing panels, and industrial products.

RE100 CLIMATE GROUP | CDP

Efforts to Reduce Environmental Impact

Toyo Rubber Chip shreds and cuts waste tires and scrap rubber (waste materials generated during the manufacture of rubber automotive parts), and then uses this material in remanufacturing.

The company's products are widely used as elastic pavement material, artificial turf filler materials, and industrial products. For 80 years, the company has been committed to utilizing resources in different ways, rather than wasting them. By harnessing the technology cultivated over the years, the company aims to step up its contribution toward the realization of a sustainable society.

Producing High-Safety Colored Rubber Chips

The company manufactures and sells colored rubber chips that are high-quality and elastic. Colored rubber chips can help reduce damage from falling down. Vivid colors and good workability make it possible to create attractively designed pavements. These materials are used in public parks, hospitals, welfare facilities, shopping centers, daycare centers, kindergartens, and many other places to provide safety and security to visitors. (Conforms to the HIC1000 safety standard)

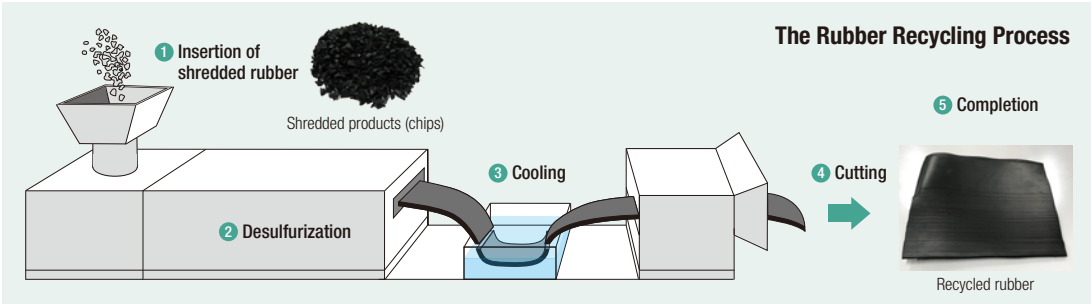
Rubber-chip paving

Omni-rubber panel construction of colored panels for pedestrians

A Circular Economy for Waste Rubber

The company's desulfurization facilities are capable of returning discarded rubber to usable raw material. We receive scrap rubber from customers' plants. We then shred, desulfurize, cool, and cut the material to make recycled rubber sheets. We return these sheets to our customers, where they are reborn as new products.

We are thus creating a rubber-to-rubber circular economy by encouraging the reuse of limited resources as new products instead of wasting them.



Comment The Tire-to-Tire Challenge

Kozo Haruyama, Representative Director Toyo Rubber Chip Co., Ltd.

For our circular economy (CE) business, we start by developing filler material for tire manufacturing with the aim of developing technology for the fine grinding of waste tires. To this end, we plan to make aggressive capital investments in fine grinding technology. In addition, to recycle waste rubber emitted from customers' manufacturing processes we are developing new products using a new press molding machine and desulfurization and regeneration using a twin-screw extruder. As a result, we are providing low-carbon and sustainable products and services to achieve a closed-loop Tire-to-Tire process.

Toyo Rubber Chip is committed to help realize a sustainable society through its recycled rubber business.