

Recycling

Automobile-related companies are obligated by the Law on Recycling End-of-Life Vehicles, enforced on January 1, 2005, to share the responsibility for creating a sustainable environment of recycling and to properly treat end-of-life vehicles (ELV). FHI recognizes that the role of automobile manufacturers is important. In addition, we strive to comply with related regulations that prohibit the use of substances with environmental impact, call back ELVs without compensation, and regulate the target figures of reuse and recovery rates in compliance with the Directive 2000/53/EC of the European Parliament and of the Council on ELVs effective since September 18, 2000.

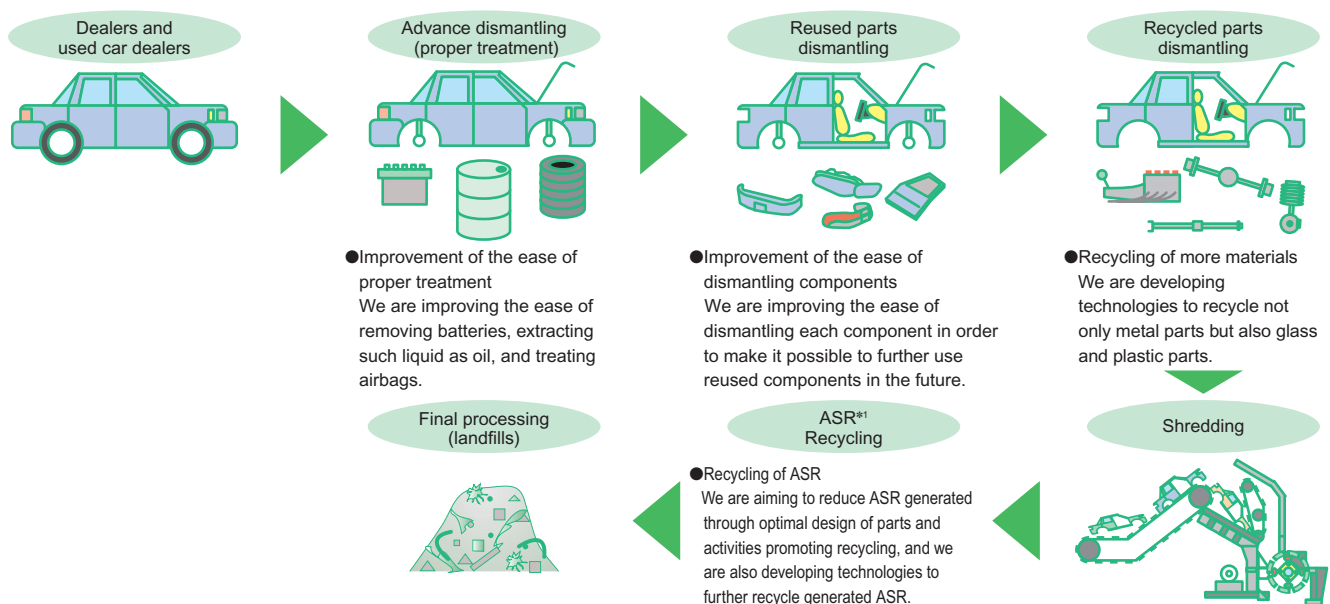
FHI is also making efforts to achieve greater efficiency and lower cost recycling while making it clear what kind of role the company should play at each stage of design, manufacturing, use, and disposal. In particular, we recognize the present situation and future of treatment of ELVs, and are planning, designing, and making efforts, always taking into consideration what vehicles we will develop and what our recycling techniques should be.

Contributions to a High-Efficiency, Low-Cost Recycling-Oriented Society

Our Efforts for the Future



Outline of Our Efforts



*1. ASR: Automobile Shredder Residue: residue left after shredding of body shell, sorted by metal type for recycling

Response to Recycling Related Laws

Law on Recycling End-of-Life Vehicles

The three characteristics of the Law on Recycling End-of-Life Vehicles:

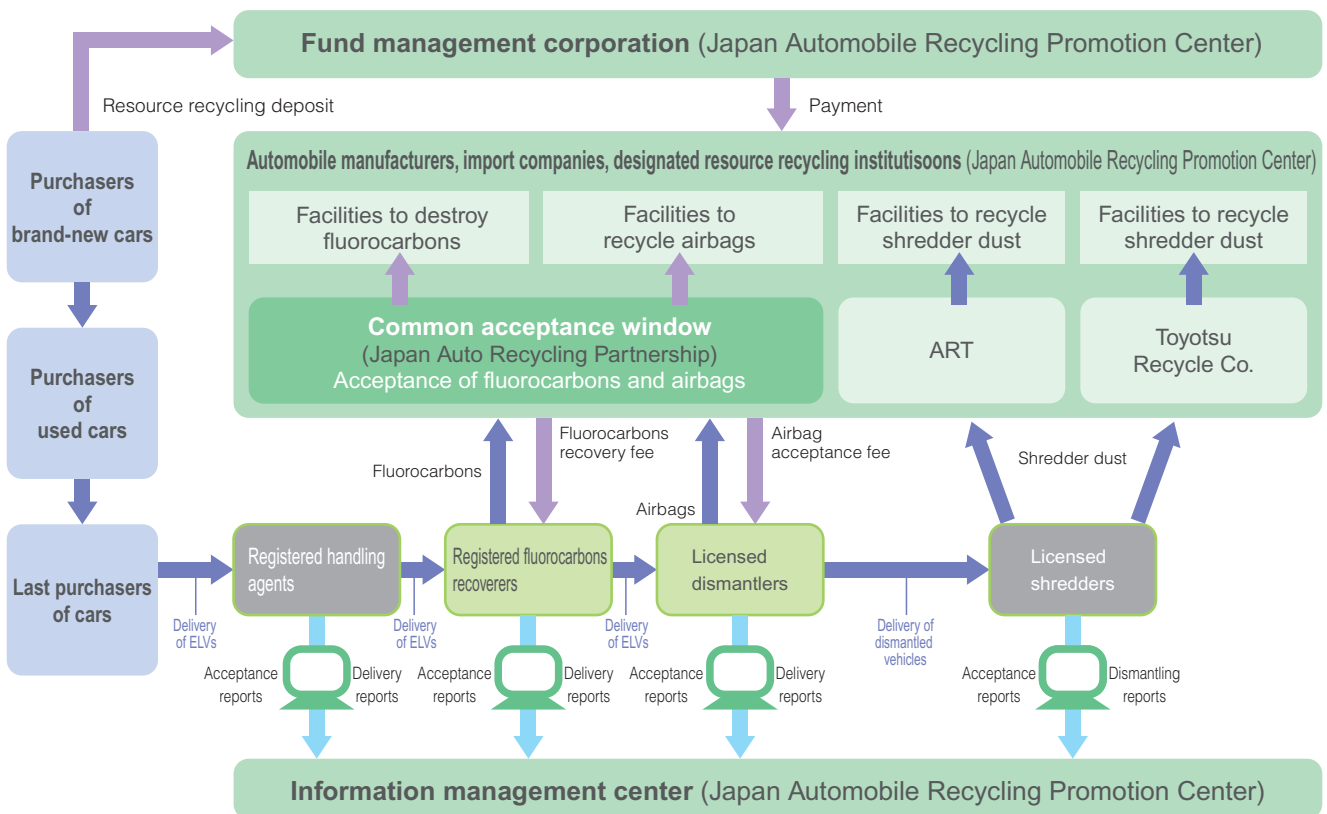
- Automobile manufacturers must accept fluorocarbons, airbags, and ASR, destroy fluorocarbons and recycle the others.
- Expenses for recycling must be paid by users in advance as recycling deposit.
- Tracking reports of ELVs after they are accepted from users until they are appropriately disposed of is required.

As for fluorocarbons and airbags, FHI established the Japan Auto

Recycling Partnership (JARP) in cooperation with other automobile manufacturing companies to establish a collection system to properly treat fluorocarbons and airbags. As for ASR, FHI established ART*¹ (Automobile shredder residue Recycling promotion Team) jointly with six other automobile manufacturers including Nissan Motor Co., Ltd. Moreover, FHI started project teams to establish internal systems for developing IT systems regarding automobile recycling and managing recycling information and expenses.

*1. ART: Eight companies including FHI, Nissan Motor Co., Ltd., Mitsubishi Motors Corporation, Mazda Motor Corporation, Suzuki Motor Corporation, Isuzu Motors Limited, Nissan Diesel Motor Co., Ltd., and Mitsubishi Fuso Truck and Bus Corporation. (as of March 2004)

▶ Outline of Law on Recycling End-of-Life Vehicles (According to the JARP Web site)



Directive 2000/53/EC of the European Parliament and of the Council on ELVs

This EU directive includes the following five characteristics.

- Prohibition against using substances with environmental impact, in principle
- Charge-free acceptance of ELVs
- Including recyclable ratio in requirements for type certificate
- Issue of dismantling manuals
- Regulation on effective recycling ratio

Subaru responded to this directive in the following ways.

First, we took measures on the three vehicle types, Legacy, Impreza, and Forester, according to the law which prohibits the usage of substances with environmental impact (lead, mercury, cadmium, and hexavalent chromium) in principle for automobiles introduced after July 1, 2003.

Second, we have established a common system with related automobile manufacturers to deal with charge-free acceptance of ELVs. Furthermore, we are using the International Dismantling Information System generally applied in Europe in order to provide information about dismantling manuals for the European market.

Design

Promotion of Design with Recycling in Mind

The Recycling Design Project Team researches easy-to-dismantle parts and vehicles, easily recycled parts structure and materials. They give feedback on the development and design of future vehicles, and prevent ASR from being generated.

Recycling Market Research

The team members continuously visit dismantling companies, shredding companies, and waste disposers in various parts of Japan to exchange views on the current and future market trends for ELV treatment. The results are used to determine the principles for designing automobiles with due consideration for recycling and extract detailed subjects for future research.

Reduction of ASR

ASR includes a huge variety of materials and chemical substances used for manufacturing automobiles, and these materials consist of a complex mix.

Consequently, the team members completely dismantled, disassembled, analyzed vehicles to identify the reasons ASR is generated, and then created the ASR Calculation Guideline for calculating the amount of ASR generated from a vehicle. Next, the Recycling Design Guideline was drafted to prevent the generation of ASR. These guidelines are already utilized for the development of Subaru automobiles.

Improving Recyclability

●Improving the Ease of Detaching Alternators

For the minicar Pleo, we used to remove the headlamp, bumper, and air cleaner before removing the alternator belt, but we made it possible to access the belt without removing any of these for our new minicar, R2. This brought a marked improvement in the ease of detaching alternators.

●Improving the Ease of Disposing Airbags

Airbags and pretensioner belts significantly contribute to reducing the shock to drivers and passengers during accidents. At the same time, the large majority of automobiles are put out of service with unused airbags.

The Law on Recycling End-of-Life Vehicles asks automobile manufacturers to dispose of these airbags, but team members are researching the optimal structure, including related components, for a safer and easier way of activating airbags in automobiles and dismantling inflators.

For example, FHI applied disc type inflators for passenger seat

airbags for easier disassembly of inflators.

●Reduction of Fluorocarbons

By 1994, FHI finished changing over from specified fluorocarbon CFC12 to HFC134a, substitute CFCs that do not harm the ozone layer. However, HFC134a is thought to influence global warming. We reduced the amount of HFC134a used by over 10% in both the new Legacy and the new minicar R2, and we are researching substitute refrigerants other than fluorocarbons.

●Improvement in the Ease of Dismantling Wire Harnesses

Most nonferrous metal, such as copper, has already been recycled. However, it is thought that it can be collected more effectively if it can be dismantled before shredding the ELVs. Since wiring harnesses are used in many parts of automobile bodies, FHI is considering a structure that makes it possible to collect more nonferrous metal in a short time.



Experiment of disassembling wiring harnesses

●Easier Material Indication

Most important is that the material in the parts can be seen easily when we recycle. FHI started to indicate the material on plastic parts in 1973 before guidelines of the industry were established. The indication was placed on the back side of the parts, but we solved the problem of confirming the material without dismantling the parts. FHI changed the indication position on the bumpers of all our vehicles.



Now the material can be seen without dismantling the bumpers. (Subaru R2)



An example of the material indication (">PP<:". PP means polypropylene.)

Reducing Substances with Environmental Impact

We are committed to curtailing our use of substances that have an environmental impact as soon as possible, not only to reduce the damage to the global environment, but also to remove the need for complicated recycling equipment and operations for end-of-life vehicle treatment. While we are promoting the recycling of parts and materials, we think it is necessary to reduce substances that have an environmental impact.

Introduction of IMDS

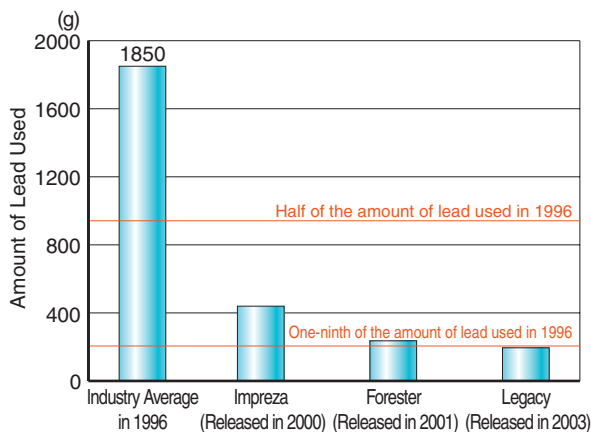
IMDS (International Material Data System) is a database system developed by a European automobile manufacturer to manage substances that have an environmental impact and to be used as data for calculating recyclable ratio. FHI introduced IMDS in 2003 and started to research some types of vehicles.

Reducing the Use of Lead

New model automobiles use no lead in the fuel tank, fuel hose, electrodeposition paint, window glass ceramics (black-tinted area), and wheel balancers. The amount of lead used in the new Legacy in 2003 was reduced to less than one-ninth of the industry average in 1996.

FHI, based on "Reduction of Substances with Environmental Impact –Self-activity by Japan Automobile Manufacturers Association, Inc." (issued by JAMA in December 2002), is promoting the reduction of lead aiming to achieve less than one-tenth in January 2006.

▶Reduction in Amount of Lead Used



Other Chemical Substances

FHI has worked to reduce its use of chemical substances. Those chemicals targeted for continued reduction are shown in the table below. In addition, the range of such targeted chemicals will be expanded.

▶Substances Subject to Ongoing Reduction Efforts

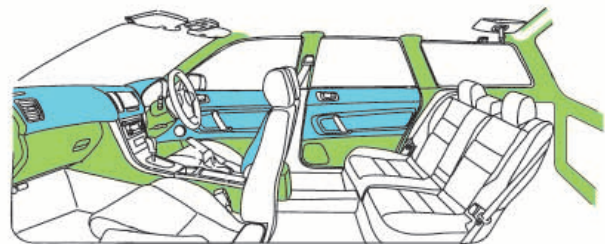
	Substance
1	HCFCs
2	Asbestos
3	Cadmium and its compounds
4	(Hexavalent) Chromium compounds
5	Mercury and its compounds

Production

System for Grade Integration of PP Plastic

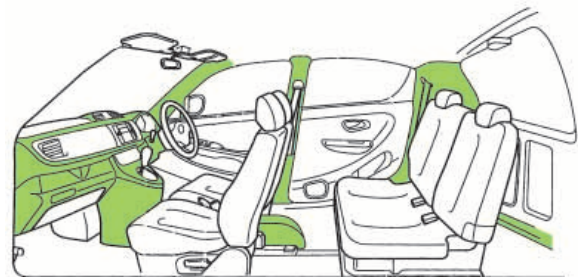
Previously, a great deal of waste was created in our material manufacturing, compounding, and parts mold-processing procedures since we had different mixes of materials depending upon the parts. In order to keep such waste to a minimum, we promoted the integration of materials. Each integrated material for bumpers and interior parts have been applied to most parts of vehicles. We are also going to further improve the efficiency of making plastic materials easier to recycle.

▶How Integrated Materials for Interior Parts are Used (Legacy)



Green parts: Integrated materials are used in these parts.
 Blue parts: Integrated materials are used in decorated base materials.

▶How Integrated Materials for Interior Parts are Used (R2)



Green parts: Integrated materials are used in these parts.

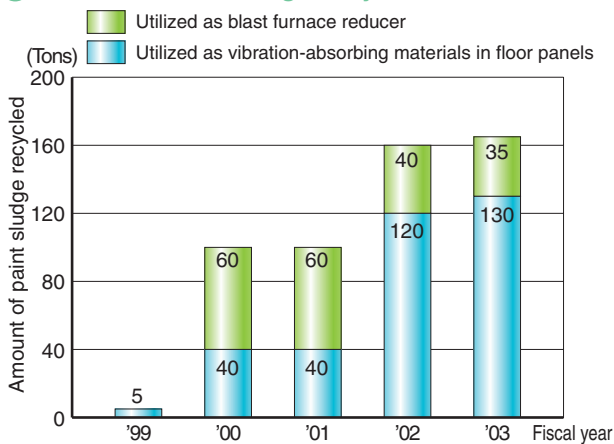
Recycling Waste Materials (Paint Sludge*1)

We found a way of recycling paint sludge given off from the paint factory. We are recycling paint sludge as vibration-absorbing materials in automobile floor panels and as blast furnace reducer. We are also considering recycling it for other uses.

As for recycling of paint sludge, the 2002 Environment Report, "Paint Sludge Recycling Plant" (see p. 30) explains in detail.

*1. Paint sludge: Waste produced during the surfacer and the top coat in the car painting process. (Waste paint that did not adhere to an automobile body)

▶ Amount of Paint Sludge Recycled

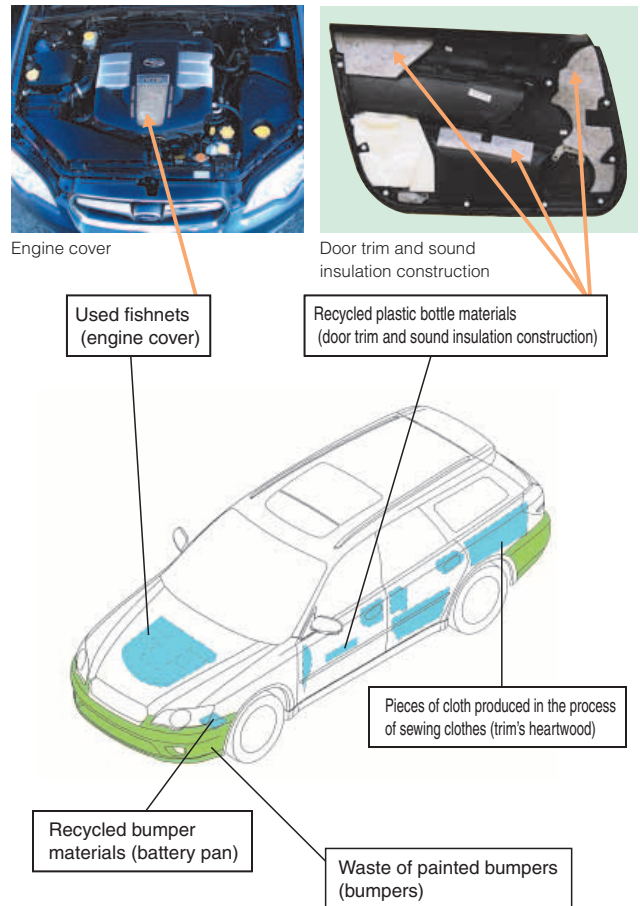


Note: The 2003 Environment Report (p. 35) had fewer figures on the vertical axis, so the values on this graph are the corrected ones.

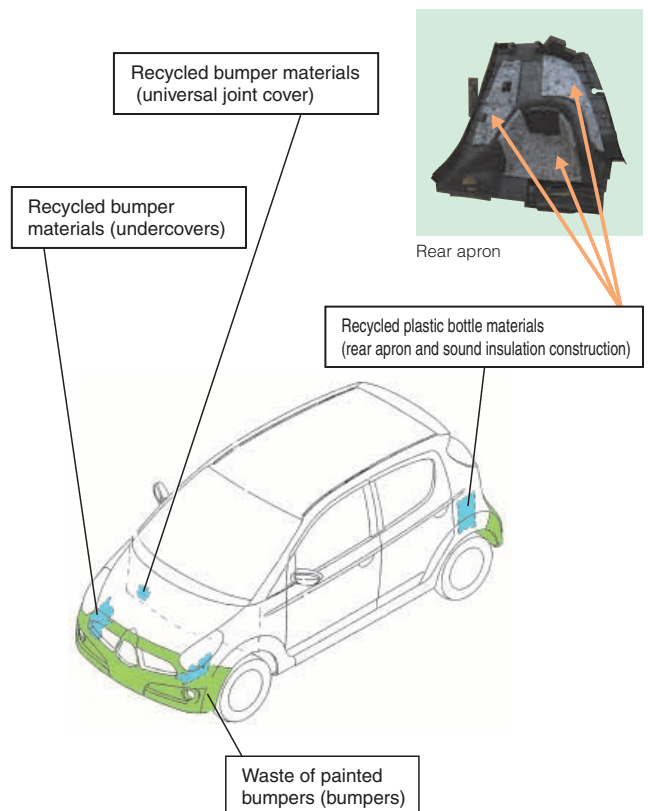
Utilizing Other Industrial Waste

FHI is going to actively utilize recycled materials discharged by industries other than the automobile industry. For waste materials generated in production plants, we are also promoting development of technology so that we can recycle and utilize the waste materials for automobiles, which are going to be produced. For example, we are recycling fishnets made of nylon resin used in the fishing industry as parts (engine covers) for the Legacy.

▶ An Example of Utilizing Recycled Materials in the New Legacy



▶ An Example of Utilizing Recycled Materials in the New Minicar R2



Sales and Services

Environmental Efforts of Subaru Dealers

FHI is working on environmental issues with Subaru dealers as the Subaru team. The Subaru team is sharing the following goals with all Subaru dealers.

- Comply with environmental laws and regulations, etc., and further contribute to the environment of the local community.
- Continue to improve the environmental management systems to create environment-friendly dealers.

In order to promote these activities, each Subaru dealer has a person in charge of promotion and the secretariat in charge of promotion. In December 2003, people in charge of promotion from all Subaru dealers got together to share information.

Since the Law on Recycling End-of-Life Vehicles is going to be enforced in the near future, FHI has been preparing so that Subaru dealers will not delay in dealing with the law by explaining the requirements at dealers' meetings and encouraging them to attend the explanatory meetings held by the Japanese government and groups concerned.



Subaru dealers' meeting for people in charge of the promotion of environmental activities (December 2003)

Iwate Subaru Inc. Acquired ISO 14001 Certification

Iwate Subaru Inc. acquired ISO 14001 certification at its headquarters, (sales, service, used car, and administrative department etc.) in March



Headquarters of Iwate Subaru Inc.

2004. The company has a policy for environmental activities that "we make efforts to realize a safe, affluent society where people and automobiles are in good harmony" and implements corporate activities with priority for environmental issues.

Note: Chiba Subaru Inc. already acquired ISO 14001 certification in fiscal year 2002, the first among Subaru dealers.

Subaru Fukuoka PDI Center Established

Subaru Fukuoka PDI Center, which started operations in August 2003, is a place where new Subaru cars dealt by seven

Subaru dealers in Kyushu are maintained before delivery. City water is used for the automatic car wash, but the discharged water is collected and 90% of it is recycled after separating oil and water by precipitating and passing through a filter.



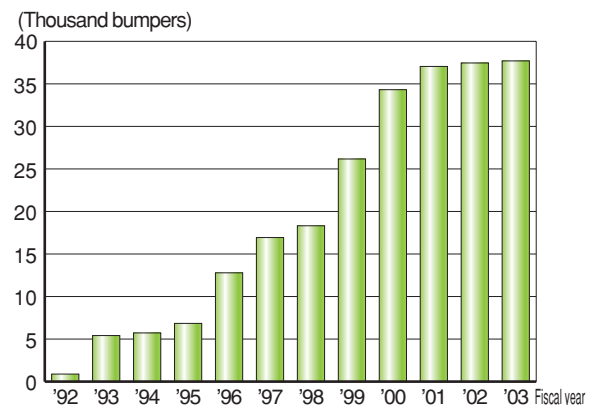
Discharged water recycling device (Subaru Fukuoka PDI Center)

Disposal

FHI established an in-house system in 1973 to identify the materials used in plastic parts, ahead of the timetable for industry guidelines for the establishment of such systems. This system is very helpful when the company collects scrapped bumpers to recycle for use in other parts of vehicles. In fiscal 2003, we collected 37,700 scrapped bumpers from all over Japan, which is a 1% increase from the previous year.

The scrapped bumpers were recycled for use in other parts of Subaru as shown in the chart below.

▶ Progress Made in Scrapped Bumper Collection



▶ Parts Produced from Scrapped Bumpers

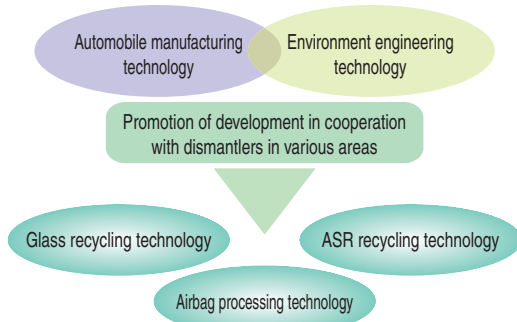
Model	Part
Legacy	Trim apron
	Battery pan
Impreza	Trim apron
	Rear gate trim
	Trunk trim
	Rear shelf
R2	Undercover
	Cover UJ
Pleo	Undercover
Sambar	Undercover
	Air guide

Disposal of End-of-Life Vehicles

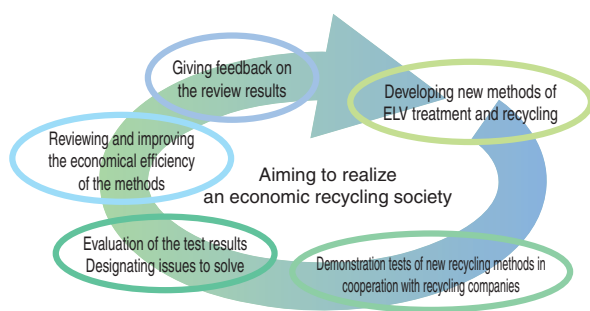
FHI is working with companies that process end-of-life vehicles to conduct research and development for the improvement of recycling processes. The results of joint development are made public in order to contribute to the realization of a recycling-oriented society. Of course, these automobile manufacturing processes are reflected in the next-generation automobiles currently in the development stages.

We are also a manufacturer that develops and sells recycling machines, as well as being an automobile manufacturer. We will continue to make a strong effort to develop more effective systems in the field of automobile recycling technology. The main technologies we are working on include one for preventing noise when the airbags activate in vehicles, one for recycling auto window glass, and one for recycling ASR.

We are contributing to the coming recycling society by taking advantage of our technology.



In order to avoid a self-satisfied way of thinking, we aim to achieve the best recycling methods by making evaluations in cooperation with other recycling companies.



Airbag Activation in Vehicles

FHI is working toward the handling of airbags without dismantling. When airbags are activated in vehicles, noise of more than 100 decibels is usually created, which is equivalent to the sound of jet airplanes during takeoff. In order to protect the environment around the treatment plant and improve the working environment, we are developing a sound arrester.

To prevent the noise from leaking outside, a sound arresting

sheet divided into seven parts for workability is glued with a rubber belt and made to cover a vehicle. The materials for the sound arresting sheet generally include lead, but FHI uses high-strength polyester for workability and recycling after use.

Airbag activation in vehicles



When sound arresting sheets are installed

Developing Auto Window Glass Recycling Technology

Most of the automobile shredder residue from scrapped automobiles is landfilled, but FHI believes that removing and recycling auto window glass, which currently accounts for approximately 20% of the shredder residue, will contribute greatly to waste reduction and bring certain advantages. In fiscal 2003, we collected about 78 tons of laminated windshield and door glass, and conducted experiments with higher accuracy than the previous year when we collected about 45 tons, in order to make materials for glass products.

FHI is also improving and developing tools for collecting glass and removing the plastic middle coat of laminated glass, which are essential for recycling, while considering a better method for collecting glass.

At present, we are working on an economical recycling system with the companies listed below. We will conduct joint studies with these dismantling companies, industrial tool manufacturers, and glass product manufacturers.

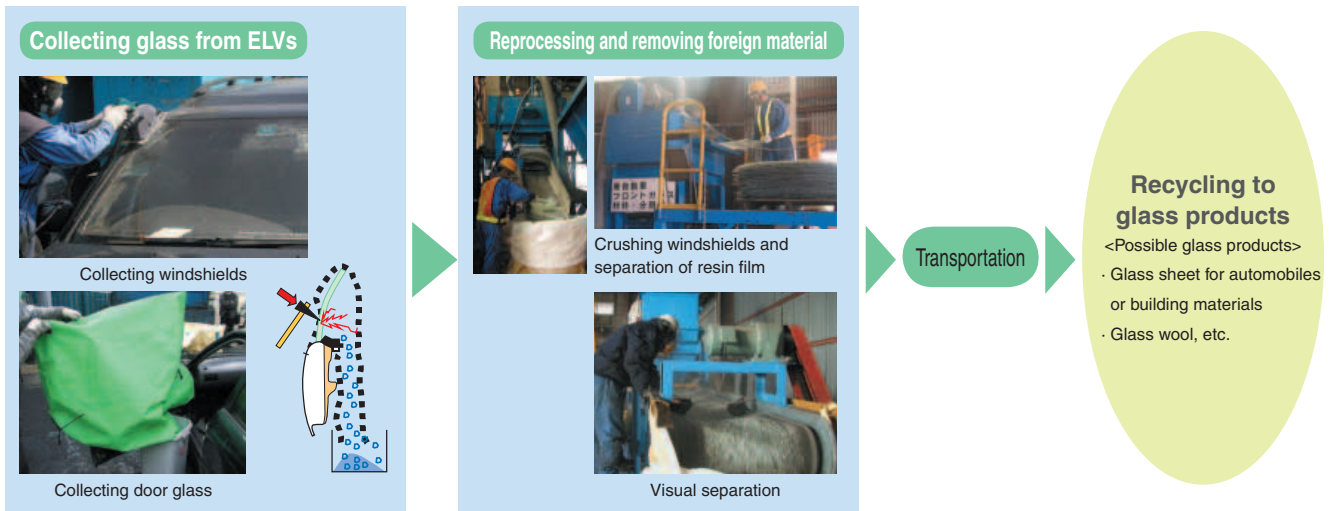
▶ Dismantling Companies

Company Name	Location
Car Steel Co., Ltd	Maebashi City, Gunma
Nagano Automobile Recycling Center Co-op	Tobu Town, Nagano
Ibajihan Recycling Center Co., Ltd.	Minori Town, Ibaraki
Tsuruoka Co., Ltd.	Oyama City, Tochigi
Metal Recycling Co., Ltd.	Kawashima Town, Saitama
Showa Metal	Koshigaya City, Saitama
Keiaisha Co., Ltd.	Yokohama City, Kanagawa
Renaissance Co., Ltd.	Kimitsu City, Chiba
Nippon Auto Recycle Co., Ltd.	Toyama City, Toyama
Sanomaru Co.	Fujinomiya City, Shizuoka
Mitsui Bussan Raw Materials Development Co.	Sakai City, Osaka
Shinsei Co., Ltd.	Minamikawachi-Gun, Osaka

▶ Tool Manufacturers

Company Name	Location
Makita Corporation	Anjo City, Aichi
Lobtex Co., Ltd.	Higashi-Osaka City, Osaka

▶ Glass Recycling Process



▶ Developing ASR Recycling Technology

FHI is endeavoring to recycle shredder dust using the small, low-cost ASR Pre-Processing Separating System, which was developed and made practicable last year. We are developing technology for making solid fuel from light substances such as polyurethane foam, plastic and fiber, and for improving the heat efficiency of thermal recycling and security by effective cleaning and dust removal of the overheated steam used for separation.

▶ Effects of Cleaning and Dust Removing of the Overheated Steam Used for ASR Separation

(Unit: mg/g, ICP analysis)

Substances measured	Amount included before separation	Amount included after separation	Amount removed	Removing ratio(%)
Natrium [Na]	0.48	0.20	0.28	53.8
Copper [Cu]	0.11	0.04	0.07	63.6
Zinc [Zn]	8.40	3.27	5.13	61.1
Iron [Fe]	7.49	2.12	5.37	71.7
Aluminum [Al]	1.13	0.37	0.76	67.3
Lead [Pb]	0.025	0.015	0.01	40.0

▶ ASR Treatment Flow Chart

