

Waste

KPI

Item	FY 2022 results	FY 2023 results
Waste Disposal	48,865 ton	54,632 ton
Achievement of total zero-emissions	Landfill rate 1.6% Percentage of bases achieving target 84.4%	Landfill rate 1.9% Percentage of bases achieving target 82.9%
Total quantity of hazardous waste transported, imported or processed, and percentage of waste that was transported internationally	NA	NA

Responsible Departments

Each business location

Our position and Targets

Why is “Effluents and Waste” a critical issue to be addressed?

Explanation of the reason and background

We believe that minimizing the impact of our business activities in Japan and overseas on the environment will lead to sustainable operations. Accordingly, we believe that it is important for effluents and waste to be minimized as much as possible in a form with a low environmental impact.

In particular, we believe it is crucial to properly handle hazardous waste without resorting to transportation or importation to foreign countries.

Vision (attainment goal) / target

We will work to achieve a reduction of 1% in waste materials per unit of waste, and aim for the attainment and maintenance of 100% recycling*1. We will then aim to achieve total zero-emissions*2 at all our production bases.

Specially managed industrial wastes such as PCB, asbestos, chlorofluorocarbons, and mercury, etc., will be appropriately processed in accordance with relevant laws and regulations.

Furthermore, we will maintain zero emissions of hazardous waste by implementing proper management practices. To this end, we will handle special industrial waste, including PCBs, asbestos, refrigerants, and mercury, in accordance with legal regulations.

*1 100% recycling: Achieve zero final disposal (= direct landfilled amount + incineration disposal amount resulting in ineffective use)

*2 Total zero-emissions: Make the direct landfilled amount zero.

Measures for vision achievement

- Even in the case of business locations that are legally entitled to have waste disposed of in landfill sites, we will look for and select industrial waste disposal contractors that do not conduct landfilling, and contract with them to undertake recycling processing.
- The processing of PCB-containing devices will be conducted within the deadline specified by law.

Review of FY 2023 Activities

Waste volume of domestic and overseas groups

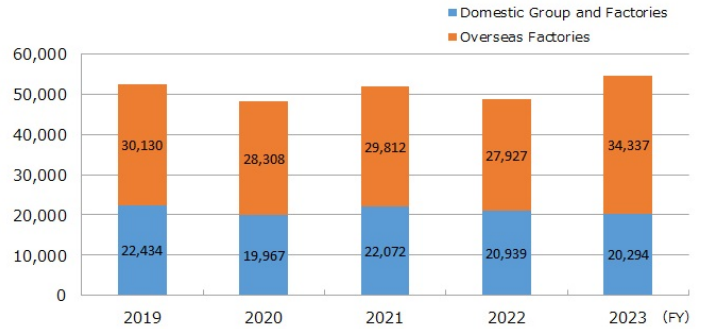
The total amount of waste (disposed of) by the entire domestic and international group in fiscal year 2023 reached 54,632 tons, an increase of 11.8% from the previous year. This increase is attributed to the inclusion of Y-TWS (expanded boundary) resulting in higher production volume, despite efforts to improve production efficiency and quality.

We have been working to achieve complete zero emissions at all production sites in Japan and overseas through recycling.

In fiscal year 2021, 857 tons (1.63%) of waste was landfilled, followed by 942 tons (1.93%) in fiscal year 2022.

In FY2023, there was an increase in production, which resulted in an increase to 1,959 tons (3.59%).

We will continue our efforts to achieve complete zero emissions and recycling treatment.



PCB Waste Storage and Management

We properly store and dispose of used PCB-containing equipment in accordance with laws and regulations. 17.2 tons of PCB-containing equipment was disposed of in FY2023.

In 2024, we will continue to properly dispose of PCB-containing equipment in use.

Hazardous Waste Disposal Flow

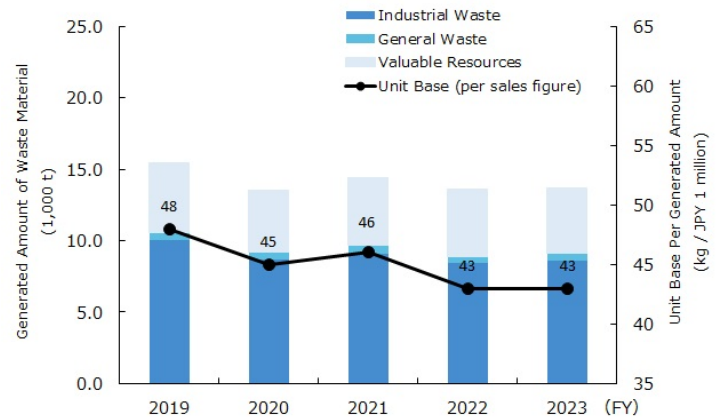


Introduction of Initiatives

At the Onomichi Plant, we have improved and strengthened water filtration capabilities, worked to stabilize water quality, and succeeded in significantly improving the period of possible repeated use.

Amount of waste material generated at production bases in Japan

In fiscal year 2023, waste generation amounted to 13,679 tons, representing a 0.26% increase from the previous year. The waste generation rate per unit of sales (waste generation intensity) also increased by 3.3% year-on-year. This increase is attributed to a decline in production volume. Conversely, the significant rise in waste generation intensity is primarily due to a 16% increase in waste disposal costs.



The processing flow for waste materials at production bases in Japan during fiscal year 2023 was as follows.



1) Excluding general industrial waste

2) Consumer paper manufacturing waste, tree planting material, various consumer waste

In order to prevent improper disposal such as illegal dumping, local audits of all our processing contractors are conducted every year. In fiscal year 2023, a total of 94 audits were conducted within domestic group companies, while 121 audits were carried out at overseas factories, confirming the proper handling of waste in all locations.

Future challenges

- Selection of overseas production bases of industrial waste disposal contractors that don't conduct landfilling
- Implementation of the disposal plan for equipment containing low-concentration PCBs within the specified timeframe
- Consider increasing the effective recycling value by increasing the ratio of valuables from industrial waste

Materials

KPI

Item	FY 2022 results	FY 2023 results
Total volume of raw materials used	(Consolidated) 1,035,000 tons	(Consolidated) 1,022,000 tons
Ratio of renewable/recycled raw material	(Consolidated) 26.2%	(Consolidated) 26.7%

Responsible Departments

Technology and design departments

※Supervised by the 4Rs Committee

Our position and Targets

Why are “Materials” a critical issue for us to address?

Explanation of the reason and background

The Yokohama Rubber Group sells products using both natural and chemically composed materials including natural rubber and water. All of these materials are made from resources available on our planet, which are by no means infinite. Therefore, we believe that it is important that we should address the challenges of delivering products that will please customers and society, while minimizing material usage, promoting the sales of recycled products (such as retread tires), and using renewable or recycled materials whenever possible.

Our policy and position relating to raw materials

The Yokohama Rubber Group has presented its environmental philosophy in the "[Yokohama Rubber Basic Environmental Policy](#)" and "[Yokohama Rubber Environmental Policy](#)", will work to develop and procure raw materials in a manner that reduces environmental impacts and minimizes material usage in accordance with the "[Yokohama Rubber Group Action Guidelines](#)".

Vision and targets

Long-term target: 100% sustainable raw materials usage by 2050

Mid-term target: At least 30% renewable/recycled raw material usage by 2030

Measures to pursue our vision

We promote the development and use of raw materials that have least impact on the environment and society through the following initiatives in order to continue our business.

We also have a system to procure sustainably-available raw materials that will have the lowest environmental and social impacts throughout their life cycles.

1. We review factors such as structural design and material rigidity to fulfill the required performance while achieving weight reductions.
2. We promote the sales of retread tires.
3. We explore and utilize innovative recycled and renewable materials, while further increasing the use of existing recycled and renewable materials.

Review of FY 2023 Activities

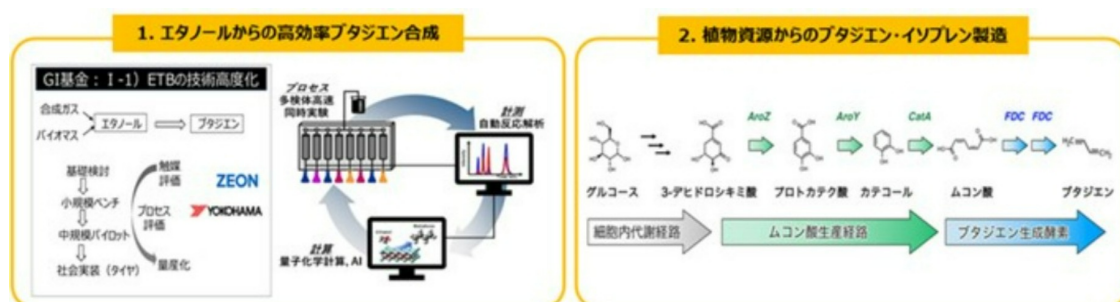
Expanding the use of renewable raw materials toward a recycling-oriented society

We have long been promoting the use of renewable and recycled raw materials as part of our efforts to realize a recycling-oriented circular economy. In addition to the use of recycled rubber, which we have been actively working on, we are now expanding the use of a wider variety of recycled and renewable raw materials, including wires made by melting and reusing scrap iron, silica made from plant-derived and inedible rice husks, and resins derived from natural materials.

In 2023, we used 252,000 tons of renewable raw materials worldwide, which accounts for 26.7% of our total raw material usage.

Toward realizing a renewable raw materials use rate of 30% in 2030, we explore and utilize innovative recycled and renewable raw materials, while further increasing the use rate of existing recycled and renewable raw materials, with the aim of solving environmental challenges our planet is facing.

The joint initiative by ZEON Corporation and us titled "Development of Manufacturing Technology for Synthetic Rubber Core Chemicals with Carbon Resource Recycling" has been adopted by NEDO as a "Green Innovation Fund Project / Development of Manufacturing Technology for Plastic Raw Materials Using CO₂, etc." The Green Innovation Fund Project is a program established by the Ministry of Economy, Trade and Industry (METI) to accelerate innovation through structural transformation of energy and industrial sectors and bold investment toward achieving the national goal of "reducing overall greenhouse gas emissions to zero by 2050." The program provides a continuous ten-year support to companies and organizations that pursue this goal as a business commitment in the areas from research and development, demonstration to commercial implementation. Our demonstration project aims to establish two advanced technologies to produce butadiene and isoprene, which are key synthetic rubber chemicals based on carbon resource recycling, from renewable carbon resources such as used tires and biomass at high yield rates, with a view to commercially implementing them in the 2030s. This will contribute to the improvement of resource recycling and carbon neutrality in the tire and rubber industries.



Outline of the Project for Development and Demonstration of Carbon-Resource-Recirculating Synthetic Rubber Core Chemicals Manufacturing Technology

Yokohama Rubber to join a tough hill climb race in the U.S. with tires made from sustainable materials for the first time

Yokohama Tire Corporation, our tire sales arm in the United States, supported 23 cars in the "101th Pikes Peak International Hill Climb" held in Colorado, U.S. on June 26, 2023, supplying "ADVAN A052" street sport tires made from sustainable materials for the first time. This is a traditional hill climb competition that has been held since 1916, also known as the "Race to the Clouds," which starts at an elevation of 2,862m and covers 20km before finishing at an altitude of 4,300m. Among the cars supported by Yokohama Rubber, the "ADVAN A052" tires made from sustainable materials were used on the "Electric Performance/NRS 2022 Tesla Model S Plaid" piloted by Blake Fuller, competing in the Exhibition Class. These ADVAN A052 tires have a more recyclable material composition than their previous version, where the sidewall rubber material, which is subject to most severe deformation during vehicle travel, has been changed from the conventional petroleum-derived butadiene rubber to a biomass-derived butadiene rubber. Blake Fuller finished the competition in the sixth place in the class he competed in.

Actually, competing in this harsh hill climb event has provided us with new knowledge and will further accelerate our development of technologies that will reduce tires' burden on the environment. We will continue to work on the development of tires featuring sustainable materials.

Robin Shute, driving the "2018 Wolf TSC-FS" in the Unlimited Class, claimed the overall victory at the Pikes Peak International Hill Climb. Shute, who also won the overall championship last year using ADVAN Racing tires, achieved a back-to-back win. The "ADVAN A005" tires he used this time have the same specifications as those exclusively supplied to the "All Japan Super Formula Championship" starting this year. They maintain the same grip performance as their predecessors while achieving a 33% sustainable material ratio.

Furthermore, Randy Pobst, competing in the Exhibition Class with the "2021 Tesla Model S Plaid" equipped with the "ADVAN A005" tire, secured second place. This tire features a higher percentage of renewable materials, including bio-based rubber in the sidewalls. This accomplishment demonstrates Yokohama Rubber's advanced technological capabilities in delivering exceptional driving performance even with sustainable materials.

Yokohama Rubber remains committed to ongoing research and development of tires incorporating sustainable materials.

Recycling activities in the MB business

Similarly, to the previous year, recycled rubber was mainly used for ballast belts with its use rate being 2.6% by weight in FY2023. We are also working to promote the adoption of recycled carbon and rubber raw materials recycled from waste tires and other rubber waste.

The plastic mold material used in the hose manufacturing process, which are thermoplastic resins, are crushed and re-melted for reuse. However, the powder generated in the crushing process used to be discarded as waste. To address this issue, we now have a highly controlled two-stage crushing process, of which first stage yields crushed particles with much larger diameters than fine powder that quickly scatters.

The finer powder generated in the second crushing stage is collected and reused, carrying the traceability information as that of the main crushed resin.

Yokohama Rubber Nagano Plant receives the "Japan Environmental Management Association for Industry (JEMAI) Chairman's Award" for its metal scrap briquetting

We received the "JEMAI Chairman's Award" for our metal scrap briquetting technique at the "Resource Recycling Technologies and Systems Awards" in 2018.

The Nagano Plant produces joint fittings for hoses and assembles hoses and fittings. The plant has developed an effective system to contribute to better resource recycling, in which the metal scraps generated during the production of metal fittings, that used to be sold to external metal scrap suppliers, are shaped into briquettes that can be used for steel production by applying massive pressure that allows forming the scraps in any designed shape so that they can be directly sold to steel manufacturers.



Future challenges

While using raw materials in business activities is unavoidable, our final goal is to be in a state which minimizes the use of the resources available on our planet.

A key issue is correctly assessing whether the use of reusable products and recycled materials actually results in a reduction in the use of the planet's resources and the environmental impact, and deploying the technique on a global level if found effective.

Products and Services

KPI

Item	FY 2022 results	FY 2023 results
Ratio of environmentally friendly products to all products handled	(Consolidated) 100.0%	(Consolidated) 100.0%
Reuse and recycling ratios for used products and packaging materials	(Consolidated) Used products Tires 65% MB 95% Packaging materials 84%	(Consolidated) Used products Tires 49% MB 100% Packaging materials 97%

Responsible Departments

Product development and planning division

Our position and Targets

Why is “Environmentally Friendly Products” a critical issue to be addressed?

Explanation of the reason and background

The LCA (life cycle assessment) method enables us to understand environmental burdens (CO2 emissions) generated at each stage of product life cycle from their production to disposal. We employed this method to conduct measurements on tires, the Yokohama Rubber Group's flagship products, and found that the CO2 emissions at the use-stage accounted for 80 to 90% of the total CO2 generation in the entire life cycle. Therefore, Yokohama Rubber Group has directed efforts particularly toward "producing environment-friendly products to achieve fuel efficiency."

Our policies and position relating to products and services

In accordance with our basic position set forth in the Yokohama Rubber Basic Environmental Policy, the [Yokohama Rubber Basic Environmental Policy](#), [Yokohama Rubber Environmental Policy](#), and the [Yokohama Rubber Group Action Guidelines](#), the Yokohama Rubber Group will work to prevent global warming, effectively use resources, and consider and improve chemical substance management with the aim of minimizing the burden of products and services provided by the Yokohama Rubber Group on the global environment. In addition, we will provide environment-friendly products with improved safety and quality (performance) to customers.

Vision

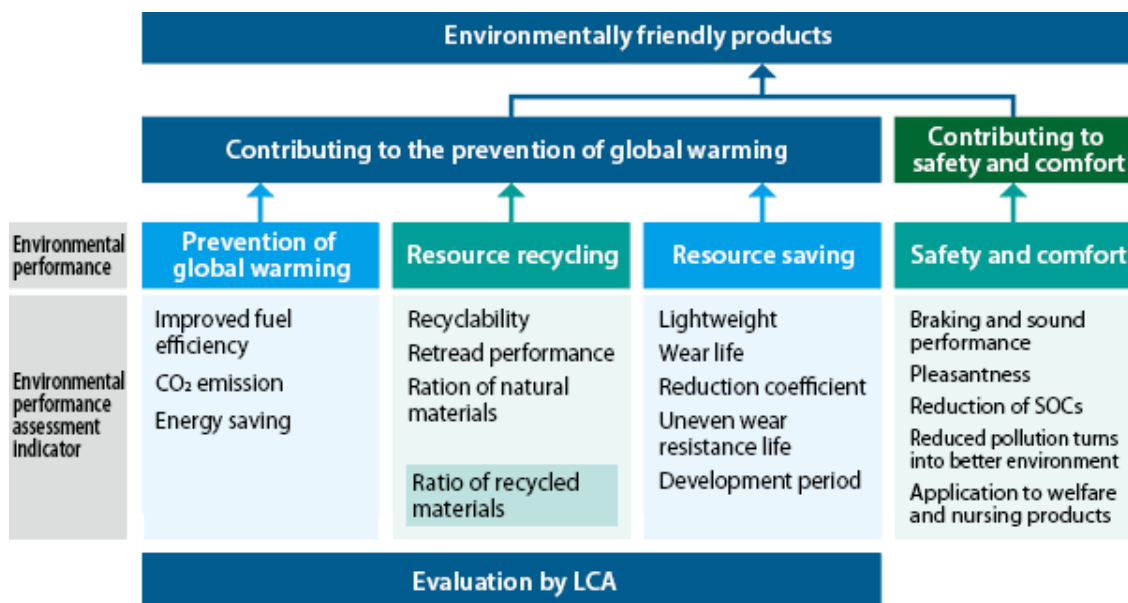
We will maintain a 100% ratio of "products that contribute to the environment," and improve product environmental performance responding to social demands.

Measures to pursue our vision

To be a "top-level environment friendly company," we will maintain "100% environmentally friendly product portfolio." In the production of environmentally friendly products, we not only simply work on the reduction of green house gas emissions through our products, but also work to ensure safety and comfort through means such as resource recycling, resource conservation, and the reduction of chemical substances contained in our products. Before the development of new products, candidate products are subject to the system in which they undergo an environment impact assessment at the early stage of the development process and need to meet our Environment-Friendly Products Regulations* at the design review stage; therefore, it is right to say that all the products released from our Group are environmentally friendly products.

※Environment-Friendly Products Regulations: Newly developed products are required to exceed conventional products by 5% or more in terms of the average scores of the four items of "prevention of global warming," "recycling and circulation of resources," "resource conservation," and "safety and comfort" with no decrease found in any of the items.

<Four pillars of environmental performances and environmental performance evaluation index>



Review of FY 2023 Activities

Results for the environmental contribution ratio (overall)

The ratio of environmentally friendly products in the Yokohama Rubber Group has remained at 100.0% since 2017. The ratio of fuel-efficient tires sold in FY2023 (consolidated) was 32.1%.

It has been calculated that the use of fuel-efficient tires led to the reduction of approximately 1,587 thousand t-CO₂ emissions in terms of "GHG emissions at the product use stage" (Scope 3), which are indirect emissions in the supply chain. In the development of environmentally friendly products, the results of the degree of their environmental contribution and environmental impact were not evaluated.

Furthermore, starting in April 2023, we began introducing electricity generated from renewable energy sources at multiple production facilities. In August 2023, we commenced operations of our own solar power plant at the Shinshiro-Minami Factory and began producing premium EV-specific ultra-high-performance summer tires like the "ADVAN Sport EV." Additionally, we are actively promoting the use of renewable and recycled materials. Utilizing these sustainable materials, we began supplying "ADVAN A005" dry racing tires in 2023.

In fiscal year 2023, the usage rate of renewable and recycled materials reached 26.7%.

Introduction of Initiatives

High-pressure hydrogen gas hoses (ibar HG82)

For a hydrogen infrastructure to be successfully spread in society, it is vital to develop pressure-tight, durable, lightweight, and flexible hoses.

Yokohama Rubber has newly developed reinforced hybrid structure utilizing PBO fiber and steel wire, and launched products that meet these requirements.



"BluEarth-GT AE51" fuel-efficient tires

Fuel efficiency has been further improved while ensuring the excellent wet grip performance well-established by our previous product (BluEarth-A). In the domestic labeling system, their wet grip performance has received the highest grade of "a" for all sizes. In terms of rolling resistance performance, BluEarth-GT AE51 has acquired "AA" for size 31 and "A" for size 26.



"ice GUARD SUV G075" studless tires for SUVs

While realizing the "iceGUARD" series basic concepts of "being effective on icy surfaces," "being long-lasting" and "improving fuel consumption," they adopt "low-heat-generating tread rubber" using the technology developed for the fuel efficient tire brand "BluEarth" in terms of "improving fuel consumption" to reduce energy loss due to heat generation and reduce rolling resistance by 5%. Furthermore, by optimizing the tread arrangement using Yokohama Rubber's original simulation technology, pattern noise has been reduced by 28% (compared in noise energy reduction rate) to improve quietness.



"BluEarth 711L" fuel efficient performance-oriented all-season truck tires

"BluEarth 711L" has achieved the highest fuel economy performance in the history of YOKOHAMA's truck tires. This performance improvement will greatly reduce transportation costs beard by our customers who often drive long distances on motorways. This product was created with new compound composition and YOKOHAMA's unique blending technique, in addition to the newly developed tread pattern with increased rigidity, the product of advanced technology, achieving 42% reduction in rolling resistance compared with "710R," our company's all-season tires. "BluEarth 711L" is the first product bearing the name of "BluEarth," the fuel-efficient tire brand, as domestic tires for heavy trucks.



"ECOTEX" energy-saving conveyor belt

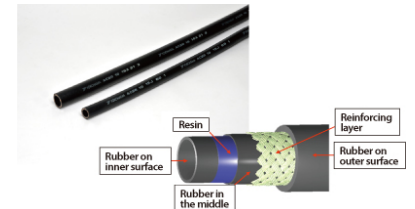
We delivered an energy-saving conveyor belt called "ECOTEX," the longest conveyor line in Japan (about 14km), to the KLT line of Chichibu Taiheiyo Cement Corporation. In addition to having its excellent durability, ECOTEX contributes to reducing the energy consumption of conveyors by optimizing the viscoelasticity of the bottom cover rubber in contact with the roller, and reducing the running-over resistance of the roller. The KLT line has achieved a significant reduction in energy consumption of more than 50% (according to our research) after the delivery compared with our conventional products. After this replacement, Chichibu Taiheiyo Cement Corporation was also awarded the "Limestone Association of Japan's Best Achievement Award" at the 77th Limestone Mining Convention, by which "ECOTEX" won the admiration for its energy-saving performance.



Car air-conditioner hoses compatible with next-generation coolant

We have developed car air-conditioner hoses compatible with HFO-1234yf, which has come to be widely used by car manufacturers in North America as a next-generation coolant for car air-conditioners. The high-pressure and low-pressure hoses newly developed this time have already been adopted.

HFC-134a, now widely used as a coolant for car air-conditioners, has a high-degree of impact on global warming with its global warming potential (GWP) being 1,430; however, the GWP of HFO-1234yf is controlled to be at four, and there is a movement to promote switching from a viewpoint of the prevention of global warming. However, HFO-1234yf has the property of decomposing gradually with long-term use and generating acid, which posed the problem of causing resin corrosion when a hose having a resin layer on its innermost surface was used. It was possible to solve this problem either by improving the resin material, or preventing contact between the resin and coolant. However, to meet the demands of car manufacturers in North America, we decided to adopt a hose structure with a rubber layer on the inner surface of the resin layer, and developed an internal rubber with improved adhesion, which led to the development of a car air-conditioner hose that prevents direct contact between coolant and the resin, as well as resin corrosion and coolant leakage.



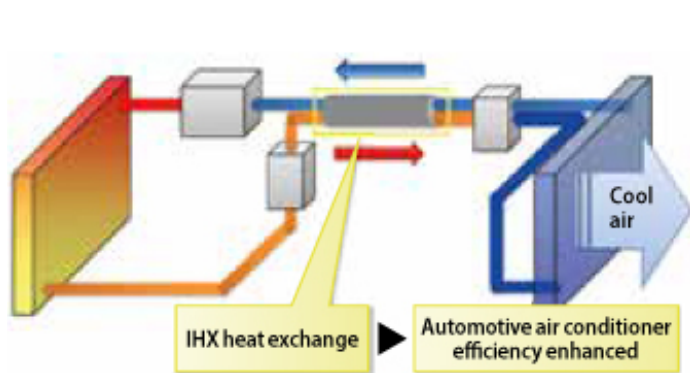
Internal heat exchanger (IHX) that improves cooling efficiency of car air conditioners

We have developed a double-tube IHX*¹ that improves the cooling efficiency of car air conditioning systems. Currently, HFC-134a, which is widely used as a coolant in car air conditioners, has a high GWP*² of 1,430, so the switch to HFO-1234yf (GWP = 4) with a low coefficient is progressing to prevent global warming. On the other hand, while the cooling efficiency of HFO-1234yf is lower than for HFC-134a, the developed double-tube internal heat exchanger can cover this drop in cooling efficiency. With a double-tube structure that integrates a part of two coolant tubes that were conventionally configured separately and using the temperature difference between the high-temperature and low-temperature coolants to exchange internal heat, it improves the cooling efficiency of the entire air conditioning system (Fig. 1). In addition, it was necessary to design the pipes according to the layout of the engine room since the car air conditioning

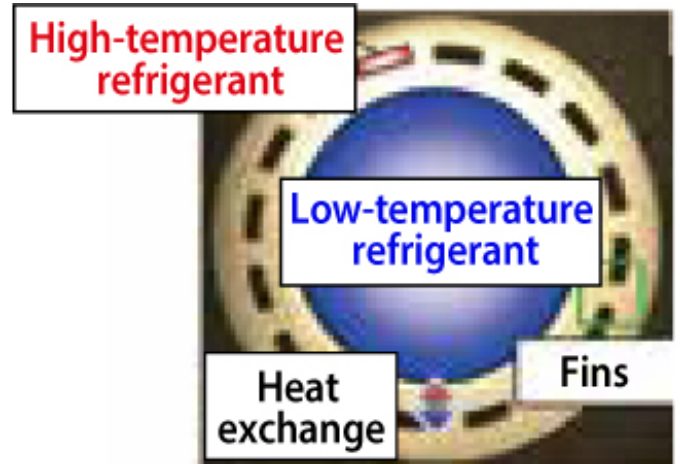
system is piped in a narrow space there, but the piping could be designed freely as with conventional air conditioning by arranging the fins inside (Fig. 2) since the coolant flow path is not crushed even if it is bent. The newly developed double-tube internal heat exchanger has already been adopted.

※1 : IHX=Internal Heat Exchanger

※2 : GWP=Global Warming Potential



(Fig. 1) Car air conditioning system using double-tube internal heat exchanger



(Fig. 2) Cross section of pipe with finned double-tube structure

"BluEarth-air EF21, BluEarth-1 EF20" light weight fuel-efficient tires

We have developed "BluEarth-air EF21," advanced technology concept tires that aim to contribute to the environment with its latest lightweight design.

"BluEarth-air EF21" adopts Yokohama's latest lightweight design technology with the aim of contributing to the reduction of total vehicle weight for the improvement of fuel efficiency and contributing to the environment through the reduction of necessary materials. By this, we achieved a lightweight, thin and highly rigid structure with a weight reduction of about 25% in mass. It also adopts a newly developed exclusive compound and "A.R.T. Mixing," the latest rubber mixing technology. BluEarth-air EF21 has received the highest grade of "AAA" for its rolling resistance performance, and its wet grip performance also has received the highest grade of "a" exhibiting excellent fuel efficiency and wet performance.

"BluEarth-air EF21" was developed in commemoration of the Yokohama Rubber's 100th anniversary, and was sold with a production limit of 100 in December 2017. Its performance has been inherited by "BluEarth-1 EF20."



Future challenges

One of the challenges we are facing is the handling of old products that are difficult to be replaced with new products due to promises made to customers.

For other products, at the end of FY2017, we achieved 100% ratio of products that contribute to the environment sold in Japan and overseas. We are determined to continue to maintain a 100% ratio of products that contribute to the environment and enhance activities to further improve the environment.