

Reducing Leakage of Microplastics: Good Practices by the Japanese Business Sector





Introduction

Currently, the amount of plastic waste flowing into the ocean is increasing around the world, and when it comes to microplastics smaller than 5 mm, it is estimated that several million tons or more flow into the ocean each year. As a result, there are concerns about the adverse effects on living organisms, ecosystems, residential environments, fisheries, and tourism, etc.

In response to this important and urgent issue, Japan proposed the "Osaka Blue Ocean Vision" at the G20 Osaka Summit in 2019, which aims to reduce additional pollution by marine plastic litter to zero by 2050. In addition, Japan also committed to ending plastic pollution at the G7 Hiroshima Summit in May 2023 with the ambition to reduce additional plastic pollution to zero by 2040. Furthermore, Japan has actively participated in the Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment, which was started in 2022.

Microplastics include resin pellets and other initially small plastics as well as micro/nano-size plastics generated from use or degradation of plastics and plastic products. In either case, such microplastics are difficult to collect once they are released into the marine and other environments, and it is important that efforts focus on waste reduction on land, runoff prevention, and use of alternative materials, etc. On the other hand, many technologies for reducing microplastic pollution are evolving day by day.

Therefore, it is important to reevaluate the existing technologies and know-how possessed by Japanese companies, etc. from the perspective of addressing microplastics while also disseminating currently available best practices in Japan and overseas.

The Ministry of the Environment is compiling initiatives and technologies by Japanese stakeholders including business sectors, etc. that contribute to the prevention, reduction, and collection of microplastics as well as alternatives, as a collection of good practices. We hope that this document will support initiatives within Japan while also helping to promote international policies to address microplastics issues.

March 2025

Ministry of the Environment, JAPAN

Office of Policies against Marine Plastics Pollution,

Marine Environment Division, Environmental Management Bureau

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GOOD PRACTICES





itochu fashion system co., ltd.

Less Micro Plastic Project

Prevention

According to statistical data*, textile products are the source of approximately 35% of the microplastics that currently flow into the ocean. In 2021, itochu fashion system launched the Less Micro Plastic Project (LMP) to reduce marine pollution due to microplastics originating from textile products. Their patented inspection technique makes it possible to visualize the quantity of microplastic fibers released by textile products during washing. LMP set a goal of reducing the discharge of microplastic fibers by 50% or more compared to current levels and is introducing fabrics and products which have cleared that goal as LMP-certified products to the market together with partner companies. LMP hopes that the development of low-emission fabrics and products will become one solution to the problem of marine pollution due to textiles.

Due to the significance of undertaking this project across the entire textile industry, LMP is breaking down barriers to share the same target with specialty textile trading companies such as Takihyo Co., Ltd., fabric manufacturers, and apparel companies to provide consumers with environmentally-friendly products through developed products. LMP also started an initiative to create a system for collecting plastic waste from beaches, etc. and develop recycled materials to prevent discarded plastic waste from breaking down into microplastics. These materials are already being gradually adopted for use in Kariyushi wear, a form of traditional Okinawan clothing, and the uniforms of water-related companies, and LMP plans to expand the circle of collaborators.

*Primary microplastics in the oceans/2017, International Union for Conservation of Nature and Natural Resources

Certification logo

Products bearing this logo have been proven through microplastic emissions testing (patented) to reduce microplastic emissions from fibers by more than 50% compared to generic, non-certified products.



LMP web site: https://www.ifs.co.jp/Imp/

Contact information

Contact field on our web site: https://www.ifs.co.jp/ TEL: 03 (3497) 4000 (Main)

CASE TEXT

Takihyo Co., Ltd.

Developing fabrics and products to reduce the emission of microplastic fibers [Less Micro Plastic (LMP) Certified]

Microplastics also include chemical fibers (plastic fibers) made from petroleum. When fleece and other raised fabric products are washed or rubbed, chemical fibers are released into the sea and air and eventually reach the ocean.

LMP certification has made it possible to visualize the amount of microplastic fibers released by textile products (fleece, brushed lining, lining, and other raised fabrics made from synthetic fiber blended fabrics using polyester staple fibers). While expanding the range of products developed with their unique technology, Takihyo will also solve the problem of marine pollution caused by textiles, which has become more severe in recent years, through the development of low-emission fabrics.

Currently, Takihyo is producing and selling apparel products using LMP-certified fabrics developed by the company in licensed products of well-known brands with a connection to nature. Going forward, Takihyo plans to publicize this initiative both in Japan and overseas through product development and sales activities at various ocean and water-related events, etc. and by developing and launching products from LMP-certified threads in cooperation with well-known Japanese brands and yarn manufacturers that are trying to solve ocean issues. In addition, Takihyo also plans to carry out activities to collect actual marine waste.

Fiber loss, including microplastics, when polyester fabrics are washed

Prevention



General products



LMP-certified products

Contact information

Public Relations and IR Team 052-587-7030 takihyo_pr@takihyo.co.jp



CASE Castiles

Teijin Frontier Co., Ltd.

Prevention

Textiles for functional clothing, that reduce fiber waste

Fiber waste that occurs during washing is believed to be one cause of microplastics, and raised processed goods such as autumn and winter fleeces have a structure that tends to produce fiber waste as washing.

Teijin Frontier is expanding the development and sales of textiles that reduce the generation of fiber waste during washing while combining lightweight bulkiness, thermal insulation, and quick-drying properties by using polyester filament fibers and devising ways to structure yarn and textiles (fabrics) without using a raising process.

[Representative textiles]

· DELTA®TL

https://www2.teijin-frontier.com/product/post/55/

· DELTA®freemo®

https://www2.teijin-frontier.com/product/post/118/

· Thermo Fly®

https://www2.teijin-frontier.com/product/post/121/





DELTA® freemo®

Thermo Fly®

Contact information

Teijin Frontier Co., Ltd. https://www2.teijin-frontier.com/



International standardization of methods to measure fiber fragments and data accumulation

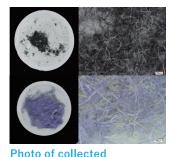
From the perspective of collecting accurate data to serve as the basis of scientific evidence, the Japan Chemical Fibers Association has cooperated with the Kaken Test Center, universities, and research institutions as well as textile material, textile product, and detergent manufacturers and consumer groups, etc. and has developed ways to measure fiber fragments that occurs during the washing of textile products. In May 2023, the international ISO 4484-3 standard was issued. This standard was proposed by Japan and formulated in cooperation with Europe, the United States, and various Asian countries.

As a result, the standard has spurred the development of textile products that generate less fiber fragments, which will help increase the added value of textile products that incorporate robust environmental measures. In addition, this standard is expected to help evaluate the amount of fiber fragments due to washing in the marine environment and estimate the amount of fiber fragments runoff.

Since 2023, the Japan Chemical Fibers Association has been investigating the amount of fiber fragments generated by commercial textile products (data accumulation and the evaluation of various textile products through ISO 4484-3) and hopes to use this information to consider countermeasures for products that are prone to producing fiber fragments going forward.



rest procedure



fiber fragments

Contact information

Technical Group E-mail:oomatsuzawa@jcfa.gr.jp Japan Chemical Fibers Association web site: https://www.jcfa.gr.jp/





Ito Yogyo Co., Ltd.

HumeCeptor MP2 Filter (manhole-type) MP2 Filter for catchment basins (catchment basin-type)

To prevent the runoff of rubber chips used in artificial turf and cushioning materials, Ito Yogyo is developing two products that capture these chips from drainage systems using special filters.

- (1) The manhole-type of filter stores the capture artificial turf in a high-capacity tank to decrease the maintenance frequency.
 - (2) The catchment basin-type of filter can be installed in an existing catchment basin.

Both filters have a high capture rate by employing two methods consisting of filter-based capture and separation from water according to the difference in specific gravity.

In terms of maintenance management, the filters are designed to make it difficult for the captured rubber chips to flow out again, and only the filter section can be removed, which makes it easy to clean and replace.

In addition to the two listed types of filters, Ito Yogyo is also proposing and developing various solutions in cooperation with other companies to solve problems according to on-site conditions.



MP2 Filter reduces the runoff of artificial turf using gravity separation and a filter

Contact information

Ito Yogyo Co., Ltd. contact form: https://itoyogyo.co.jp/contact/



Mizuno Corporation

Microplastics runoff prevention system for sports facilities

Runoff Reduction

The entire Mizuno MS CRAFT Series of artificial turf products uses curled yarn, which reduce filler runoff by 70% or more compared to straight yarn. The inhibitory effect of the MS CRAFT Series has been verified by the Environmental Technology Verification (ETV) program of the Ministry of the Environment. In addition to significantly reducing the runoff of microplastics with the MS CRAFT Series, Mizuno is also proposing measures for the surrounding facilities such as installing collection filters in catchment basins, installing entry and exit gutters to remove filler stuck to the athletes' shoes, and installing nets to prevent filler from being blown outside of sports facilities by the wind. This system is able to reduce microplastics in both the artificial turf and the facilities.

While the system reduces microplastics from sports facilities in terms of both the artificial turf and the facilities, it can also be introduced in facilities using artificial turf provided by other companies. Mizuno plans to expand the introduction of this system in cooperation with sports facility owners and managers.



MSCRAFT Series

Mizuno's unique crimp-yarn processing technology reduces the runoff of filler outside the facility. In addition, the temperature-suppressing pile prevents temperature increases in the summer.



Catchment basin filter

This type of filter is installed in catchment basins inside sports facilities. It catches artificial turf yarn and filler runoff that is washed outside of sports facilities by rainwater.

Contact information

Product introduction:

https://sports-facilities.mizuno.jp/environment/artificial-turf/



CASE Artificial Artificial

Sumitomo Rubber Industries, Ltd.

Alternatives

Artificial turf system that uses natural filler material

Sumitomo Rubber Industries, Ltd. is advancing an initiative to replace some of the temperature-suppressing chips used in artificial turf for sports from polymer to natural materials as a measure to prevent marine pollution caused by microplastics.

With conventional polymer materials, there is a risk that they will wash away from the sporting grounds and into rivers during rainy weather, etc.

However, replacing them with natural materials lowers the risk of environmental load even if they wash away. In addition, they are expected to feel similar to natural turf and reduce temperatures during the summer.

These effects have already been positively evaluated by several professional sports facilities that have already adopted the artificial turf system.

Sumitomo Rubber Industries will continue to research and develop not only filler materials but also materials for artificial turf blades that help reduce microplastics.



Artificial turf system using natural filler material that has actually been installed in the facilities of professional sports teams

Contact information

Sumitomo Rubber Industries, Ltd. long-pile artificial turf brand site: https://hibrid-turf.com/

CASE 08 AGC Inc.

Naturally-derived silica microspheres as microplastic beads alternative

Alternatives

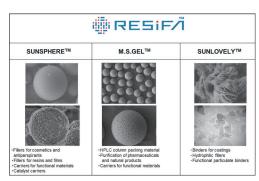
Silica exists in nature in various forms, and approximately 60% of the Earth's crust is composed of minerals that contain silica. Amid growing concern about the impact on ecosystems due to microplastics flowing into the ocean, there is growing interest in silica microspheres as a substitute.

AGC Si-Tech offers silica microspheres products suitable for various applications including cosmetics, industry, and pharmaceutical production under the integrated brand RESIFATM. For example, the spherical SUNSPHERE® microspheres derived from 100% natural silica have been widely used in cosmetics around the world for more than 30 years.

SUNSPHERE[™] is provided in a product lineup with various sizes of microspheres (the radius of 3,5,10 micron etc.) and realizes varied functions.

With the growth of the global market for cosmetics (annual rate of 4% or more) and the growing demand for natural silica as a substitute for microplastics, facility expansion will be implemented to increase production capacity of SUNSPHERE™ by approximately 1.5 times that of the level in 2023. Operations are scheduled to begin in the second quarter of 2025.

Silica microspheres that return to nature and cycle through nature are friendly to both people and the earth.



Integrated Silica Product Brand RESIFA™

Contact information

AGC Si-Tech Co., Ltd., Tokyo Branch TEL: +81-3-6214-3833 Contact URL: https://www.agc-sitech.com/en/contact/ Company web site: https://www.agc-sitech.com/en/ Related web site: https://www.agc-sitech.com/en/silica/ Product introduction: https://www.agc-sitech.com/en/product/



09 CASE **KANEKA Corporation**

Development of the KANEKA Biodegradable Polymer Green Planet® that is biodegradable in seawater

Alternatives

The KANEKA Biodegradable Polymer Green Planet® is plant-based biomass polymer made from vegetable oil. It is accumulated polymer in microorganisms. It can be molded in various shapes in the same way as fossil-based plastics. The polymer is biodegraded by microorganisms in various environments such as seawater and soil. Even if it unintentionally leaks into the ocean, it will biodegrade into water and carbon dioxide (CO2) without remaining in the environment. Therefore, Green Planet® can contribute to reducing marine pollution by plastics.

Kaneka has an annual production capacity of 20,000 tons and is currently working on replacing single-use plastics. Kaneka expects the global market size to be 25 million tons, and will work to expand applications and increase production capacity in the future. In addition, we have begun production of Green Planet® used cooking oil as a raw material. Furthermore, we are developing production technology using CO2 and H2 as raw materials.



Examples of Green Planet® product applications

Contact information

Introductory web site: https://www.kaneka.co.jp/en/solutions/phbh/index.html Contact information: bdp_phbh@kaneka.co.jp

CASE 10 Nippon Paper Industries Co., Ltd.

Developing heat sealable paper using biodegradable resin

Bourbon Corporation Japan/KANEKA Corporation/Nippon Paper Industries Co., Ltd.

The Lamina® heat-sealable paper that Nippon Paper Industries previously sold provides heat sealability by applying a water-based coating to the paper. However, the heat-sealing layers use petroleum-based resins. With the goal of developing a more environmentally-friendly paper material, the company focused on KANEKA Biodegradable Polymer Green Planet®. Green Planet offers superior biodegradability and degrades into CO2 and water not only in soil but also seawater, which enables it to limit its impact on the marine environment. Nippon Paper Industries successfully developed a biodegradable heat-sealing paper by emulsifying Green Planet® and using it as a heat-sealing resin.

Compared to conventional petroleum-based resins, it is expected to be highly effective in reducing the generation of microplastics by increasing the biomass ratio and adding marine biodegradability to the adhesion layer.



"Bourbon 4 Kinds of Bite Sweets" from Bourbon Corporation Japan

Contact information

Contact information: Paper Promotion Group, NPG Products Promotion Center Corporate Planning Division, Nippon Paper Industries Co., Ltd. (Mail: gpu70009@nipponpapergroup.com) Introductory web site: https://www.nipponpapergroup.com/news/year/2022/news221110005341.html



Alternatives

Alternatives



Rengo Co., Ltd.

Replacing microplastic beads with cellulose

Viscopearl® is a biodegradable, spherical cellulose bead that is composed of 100% cellulose derived from wood pulp. Featuring a wide range of particle sizes from 3 μ m to 4 mm, it has a high affinity for both water and oil as well as chemical and heat resistance; therefore, it can be used for a variety of purposes, such as cosmetic raw materials, resin and rubber additives, and abrasives, etc.

In addition, because it is biodegradable in both soil and the ocean (certified "OK biodegradable SOIL" and "OK biodegradable MARINE"), Viscopearl® can be expected to help reduce microplastic waste by replacing plastic particles which may leak into the natural world.



Viscopearl®



Electron micrograph photo

Contact information

Functional Materials Sales & Marketing Department Email address: seihin-qa@rengo.co.jp

CASE 12

Mitsubishi Chemical Corporation

Developing products that use marine biodegradable plastics

"BioPBS™", biodegradable resin derived from plants and certain grades of "Forzeas™", biodegradable resin compound using BioPBS™ have obtained "Marine Biodegradable Biomass plastics", certification from the Japan BioPlastics Association. By making full use of this certification, Mitsubishi Chemical Corporation is working on developing fishing gear such as environmentally friendly lures and fishing basket, as well as expanding the applications of single-use plastic products such as straws and plastic bags to help solve environmental issues.

With mainly focusing on food packaging and products used in marine environments that may unintentionally leaked into the ocean, we aim to develop new applications through close collaboration with various companies both domestically and internationally.



Straws made from biodegradable plastic

Contact information

Reference URL:

https://www.m-chemical.co.jp/products/departments/mcc/sustainable/product/1209172_7166.html



Toray Industries, Inc.

13

Developing a spherical, marine biodegradable polyamide 4 fine particle

Toray Industries, Inc. is developing spherical polyamide 4 microparticles that are both biodegradable and marine biodegradable, which can serve as alternatives to polymer particles used in life science applications (such as cosmetics) that pose environmental leakage concerns. Due to its unique properties, it was difficult to obtain highly spherical fine particles of polyamide 4, which are important for life science applications. However, Toray Industries, Inc. successfully created the first spherical fine particles by applying their unique phase separation particulation technology. The company will advance quality improvement and the establishment of an industrial mass production system, accelerating social implementation and contributions to the environmental society.

The company is considering expanding applications beyond life sciences to those that can reduce the environmental burden. Additionally, Toray Industries, Inc. is promoting the development of polymer materials that do not rely on fossil fuels for raw materials and are more environmentally friendly.



Enlarged photo of the "SP-500-MD" spherical polyamide 4 fine particle

Collection

Contact information

Ayumi Shibata, Tokyo Functional Resins First Section, Functional Resin Division

Email address: ayumi.shibata.g3@mail.toray

Related web site: https://www.plastics.toray/ja/news/article.html?contentId=wroobdj9

CASE 14 **Shimadzu Corporation**

Microplastic Automatic Preparation Device for collecting microplastics from environmental water samples

To collect microplastics present in environmental water samples, chemical processing is important to remove naturally-derived substances in the samples. However, this chemical processing is a complex task and may impact the precision of the survey results that are ultimately obtained.

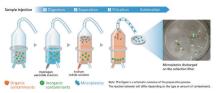
To address this issue, Shimadzu productized the MAP-100 microplastic automatic preparation device and automated the complex pretreatment works. In addition to automating the pretreatment, Shimadzu will contribute to environmental survey work by providing a wide range of technologies including microplastics observation, composition analysis, and quantity evaluation, etc.

Since its launch in 2023, the MAP-100 microplastic automatic preparation device has been adopted mainly by research divisions engaged in environmental water monitoring.

Going forward, Shimadzu will expand actions to environmental research organizations, university researchers, and contract analysis organizations in Japan and overseas.



Microplastic Automatic Preparation Device MAP-100



Operational image

Contact information

Environmental Business Unit, Analytical & Measuring Instruments Division Email address: h5-6_contact@group.shimadzu.co.jp



Heisen Yoko Co., Ltd.

15

Automated collection of microplastics with the JELLYFISHBOT marine drone

Collection

The JELLYFISHBOT is a marine drone that can collect trash and heavy oil floating on the surface of the ocean, rivers, and lakes, etc. It can switch between manual and automated operation with a maximum automated operating time of 15 hours*. The onboard camera built into the drone enables the operator to check locations that are difficult to visually confirm via video. Microplastics are collected by installing a 1 mm or 200 μm mesh net on the drone. The unit weighs 25 kg including the battery and is light enough to be transported by one person. It is extremely simple to operate, but explanations are provided online as needed during use.

The drone can measure the water depth and create a bathymetric map while collecting trash floating on the water including microplastics. The manufacturer is currently developing a system to enable contactless, automatic charging.



The JELLYFISHBOT marine drone collects substances floating on the water (seaweed, plastics, and toxic substances).

*According to a survey by the manufacturer. During automated operation

Contact information

Okada, Business Planning Unit: hikaru.okada@heisengp.co.jp TEL: 03-3865-3621

Product web site: https://jellyfishbot.jp/
Company web site: https://www.heisengp.co.jp/

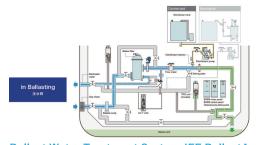
CASE 16 **JFE Engineering Corporation**

Collecting microplastics using a ballast water treatment system equipped with a filtration device

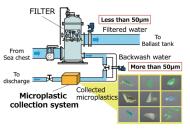
To balance the vessel when not carrying cargo, vessels pump ballast water (seawater) into ballast tanks and discharge that water when loaded with cargo. To prevent organisms from spreading through this ballast water and adversely affecting ecosystems, vessels are required to equip a treatment system that detoxifies the ballast water.

The Ballast Water Treatment System JFE BallastAce® from JFE Engineering Corporation uses a filter to capture living organisms that are 50 µm or larger and release them into the raw water environment. This filter captures not only living organisms but also microplastics, so the company is considering a system to collect microplastics during the release process. The company validated a facility proposal at an in-house facility and conducted a test collection of microplastics.

JFE Engineering Corporation is developing the technology in cooperation with other companies and is exploring the test collection of microplastics from the ocean on vessels that are currently in service.



Ballast Water Treatment System JFE BallastAce®



Details of microplastic removal parts

Contact information

Yusuke Shimono, Marine System Department, Prime Mover Division

Email address: shimono-yusuke@jfe-eng.co.jp Related web site: https://jfe-ballast-ace.com/



CASE 17 MIURA CO.,LTD.

Efficient microplastic collection device utilizing a cyclone separator

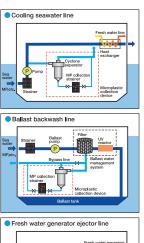
Collection

Ships navigating the world's oceans take on and discharge large amounts of seawater for various purposes such as water to cool the engine, ballast water to maintain the vessel balance, and water to drive the ejector used in the fresh water generator, etc.

By installing a cyclone separator in the various seawater lines on a ship, MIURA established a method to separate and condense microplastics floating in the seawater and efficiently collect them from the condensed, small-diameter lines using a collection strainer. The treated water from which the microplastics have been separated out is returned to the original seawater lines to enable the collection strainer to be opened and cleaned without stopping the flow of engine cooling water that must flow at all times.

This system was implemented with the cooperation of Mitsui O.S.K. Lines, a major Japanese marine shipping company.

Going forward, MIURA hopes to focus its efforts on PR and sales promotion aimed at the shipping industry and contribute to the preservation of the global environment.



Fresh water generator

Fresh water

Power

Reparator

Microplatic

Strainer

Microplatic

Octobasic

Strainer

Microplatic

Contact information

MIURA CO.,LTD. E-mail:hakuyo eka@miuraz.co.jp Installation example of the microplastic collection device utilizing a cyclone separator

CASE 18

Suzuki Motor Corporation

Collection

Outboard engine Micro-Plastic Collecting device

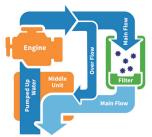
By focusing on the structure of the outboard engines, which pump in a large amount of water to cool the engine while operating and then return the water after cooling, Suzuki Motor Corporation developed a type of filter that can be attached to the return water hose and collect microplastics.

Because this system utilizes the return water after the engine cooling, it does not impact the operating performance of the outboard engine. The filter can be easily replaced by opening the engine cover, which enables the continuous collection of microplastics.

Currently, the company is also jointly researching technologies to identify the collected microplastics together with Shizuoka University. Suzuki Motor Corporation believes that putting this identification technology into practical use in the future will make it possible to visualize the amount and type of plastic collected through image recognition, which will enable timely data acquisition and help customers become more familiar with efforts to reduce marine plastic waste.



Micro-Plastic Collecting device Standard equipment for the DF140BG/DF115BG/DF140B/DF115B/DF100C



Structure of Micro-Plastic Collecting device

Contact information

Overseas Communications Department Corporate Communications Division $+81\mbox{-}53\mbox{-}440\mbox{-}2030$

Marine Sustainability https://www.globalsuzuki.com/marine/sustainability/





Activities for controlling the outflow of resin pellets, etc.

Public Awareness

In 1991, it was confirmed in various locations that resin pellets, the raw material for plastic products, were washing ashore. In response to this, The Japan Plastics Industry Federation

began an investigation into resin pellet leakage in cooperation with industry, government, and NPOs in 1992, and it created and distributed a "resin pellet leakage prevention manual," conducted a survey, and took other measures to firmly promote awareness-raising activities within the ndustry and prevent leaks. In 2021, a new leaflet was created for small and medium-sized businesses, and with the cooperation of government offices and regional governments, it is being distributed nationally.



Leaflet "To all businesses that handle plastic pellets"

Contact information

Administration / Environment Group E-mail: infor@jpif.gr.jp

Document URL: https://www.jpif.gr.jp/environment/ocean/resin-pellets/doc/leaflet_2021.pdf



"Plastics Smart" campaign

The Ministry of the Environment is conducting the "Plastics Smart," (for short "PLA-SMA") campaign to promote proper understanding of the state of plastic pollution in the marine and other environment, as well as smart ways of living with plastics. The campaign targets a wide range of stakeholders, including individuals, local governments, NGOs, businesses, and academics including research institutions. It aims to reduce plastic waste including microplastics, while promoting garbage separation, emission control, and the 3Rs of plastics, etc.

On the campaign's website, approximately 3,500 cases of measures taken by businesses and local governments are available to the public as "PLA-SMA ACTIONS," and new registrations are always available via the application form on the website.

The current featured article "Toward Reducing the Occurrence and Discharge of Microplastics" introduces countermeasures for artificial turf and fiber-derived microplastics. The articles will keep being updated.



"Plastics Smart" Dedicated Website





Please check our website here

Contact information

Ministry of the Environment, JAPAN
Office of Policies against Marine Plastics Pollution,
Marine Environment Division, Environmental Management Bureau

TEL: +81-3-5521-9025 https://plastics-smart.env.go.jp/



