Good Practices
for Reducing Microplastics

Plastics Smart

Ministry of the Environment

Ministry of the Environment, Japan
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Introduction

At the G20 Osaka Summit held in June 2019, the “Osaka Blue Ocean Vision,” which aims to eliminate additional pollution due to marine plastic waste by 2050, was shared by Japan. To achieve this vision, microplastics must be addressed as well.

The technology for reducing microplastics has not been confirmed worldwide. Under such circumstances, in order to effectively reduce pollution, it is important to review the technology and know-how possessed by Japanese companies from the perspectives of prevention, reduction, and collection of microplastics, and to disseminate the best technology and know-how available at the present time both domestically and internationally.

The Ministry of the Environment has compiled a collection of good practices on the efforts and technologies of Japanese companies that contribute to prevention, reduction, and collection of microplastics.

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CASE 01

Adastria Co., Ltd.

Laundry net with enhanced ability to reduce fiber fragment outflow

Using a laundry net when washing can prevent both damage to clothes and the outflow of plastic chemical fiber fragment. Adastria Co., Ltd. is developing a laundry net that enhances the suppression of fiber fragment outflow.

Standard laundry mesh nets have a hole size of about 0.7 mm, but the size of holes in this net is 0.05 mm, allowing it to catch finer fiber fragment. Furthermore, by giving it a two-layer structure and attaching fasteners on the top and bottom, the finely woven fabric on the front side prevents the outflow of fine fiber fragment, including microplastics, making it easy to remove the fiber fragment that accumulates inside the net. We are also aiming to devise ways to lower the price for consumers to help spread these kinds of initiatives.

Laundry net under development

Fiber fragment collected inside the laundry net

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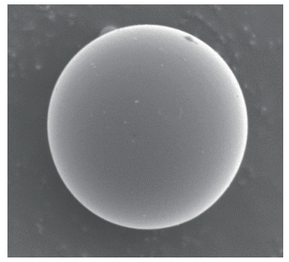
CASE 02

Daicel Corporation

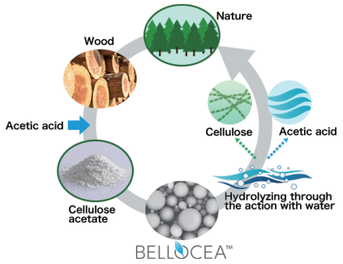
Development of substitution materials for cosmetics using cellulose

Daicel Corporation is developing advanced spherical fine particles of cellulose acetate, which is a naturally recurring material manufactured from cellulose, as a replacement for the microplastics used in cosmetics.

Because the fine particles obtained through our original perfect sphere fine particle technology are like marbles with a smooth surface and excellent sphericity, they can generally achieve the same functionality as conventional plastic fine particles while being eco-friendly.



Enlarged picture of "BELLOCEA®"



Spontaneous Regression of BELLOCEA®

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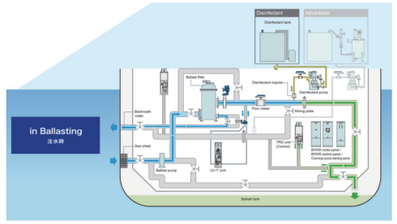
CASE 03

JFE Engineering Corporation

Removing microplastics using a ballast water treatment device equipped with a filtration device

In order to balance ships when they are empty, they take seawater (ballast water) into a tank inside the ship and drain it when the ship is loaded. Since organisms are dispersed through this ballast water and adversely affect the ecosystem, devices for detoxifying the ballast water are compulsory.

JFE Engineering uses a filter in its ballast water treatment equipment, "JFE BallastAce®," to capture organisms 50 μm or larger before release the water into the raw water environment. Since the filter captures microplastics as well as organisms, we are currently planning a mechanism for collecting these microplastics when the water is released.



Ballast Water Treatment Device JFE BallastAce®

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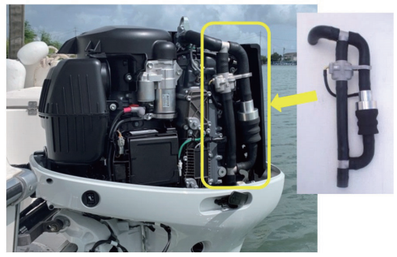
CASE 04

Suzuki Motor Corporation

Outboard motor microplastics recovery device

We focused on the structure through which outboard motors propel vessels—pumping large amounts of water to cool the engine and returning the water after cooling it—to develop a type of filter that can be attached to the return water hose and collect microplastics.

Because this device utilizes the water that is returned after it cools the engine, it does not affect the cruising performance of the outboard motor. The filter can easily be replaced by opening the engine cover, allowing for the continuous collection of microplastics. In addition to microplastics, we have also collected fishing lines and the like.



Outboard motor equipped with a microplastics recovery device

Examples of vessels to which it can be installed
Outboard motor boats (Targets: pleasure boats, fishing boats)

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CASE 05

Spiber Inc.

Practical development of artificial protein fibers

As one type of bioplastic, protein materials are attracting attention as a new option. This is because (1) they can be produced via a fermentation method that uses microorganisms, so their primarily materials do not rely on fossil resources and are highly biodegradable; and (2) various properties can be imparted by controlling the ratios and arrangement of the amino acids.

Spiber Inc. is leading the world in the practical development of artificial protein fibers by collaborating with THE NORTH FACE to launch products, and it plans to begin operations at a plant in Thailand for producing raw protein materials in 2021.

Practical development of artificial protein fibers

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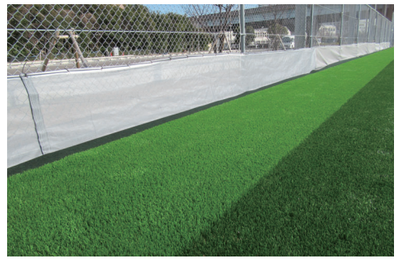
CASE 06

Sumitomo Rubber Industries, Ltd.

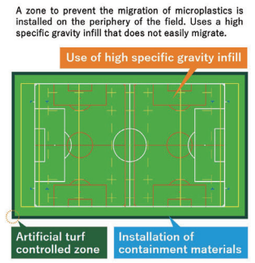
Demonstration test for controlling microplastic migration from artificial turf

When it comes to plastic (long pile) artificial turf used for sports, many years of use may result in elastic infill and broken pieces of artificial turf escaping from sports field. To prevent the outflow of these materials, Sumitomo Rubber Industries, Ltd., in cooperation with Nishinomiya City, which owns and manages facilities, is conducting the first demonstration experiment in Japan as a public example of the viability of its solution.

We are verifying the effects by taking measures such as (1) modifying the artificial turf layout (installing barriers and a maintenance zone), (2) installing barriers on field perimeter fence (mesh nets/non-woven fabric), and (3) installing barriers inside drainage canals (dedicated metal fittings/filters).



Artificial turf that can prevent microplastic migration



Sports fields that prevents marine pollution

Contact infomation

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CASE 07

Teijin Frontier Co., Ltd.

Fiber structures for functional clothing that reduce fiber fragment

Products that have undergone piloerection generally have a structure that tends to generate fiber fragment during laundry cycles. TEIJIN FRONTIER CO., LTD. has developed a functional clothing product that can reduce the generation of fiber fragment during wash cycles while taking advantage of the texture and heat insulation created during the piloerection process.

This is achieved by using polyester filaments and constructing a lightweight and bulky garment fiber structure without using piloerection. In addition, using special functional fibers and structures can prevent the unpleasant sticky sensation caused by sweat absorption and quick drying, as well as the cold sensation caused by sweat cooling.

DELTAPEAK™TL

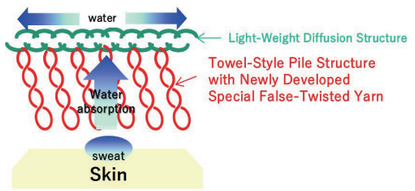

Image of fabric cross section

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CASE 08

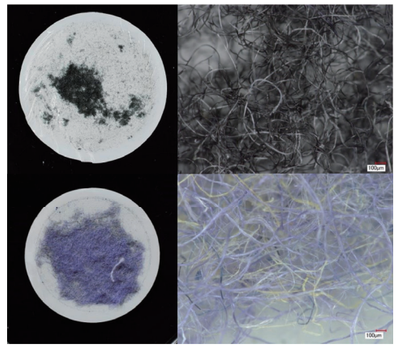
Japan Chemical Fibers Association

International standardization of fiber fragment measurement test method

Currently, there is no standardized measurement method for determining the amount of fiber fragment that flows out during laundry cycles. The Japan Chemical Fibers Association, in cooperation with related industries, is proceeding with development with the aim of ISO standardization originating in Japan so that the amount of fiber fragment that flows out during laundry cycles can be measured using conditions similar to actual laundering.

This will promote the development of textile products that generate less fiber fragment and is expected to set Japan's high-performance textile products apart. Moreover, it shows potential for contributing to the evaluation of the amount of laundry-derived fiber fragment in the marine environment and estimates of the amount of fiber fragment outflow.

Test procedure



Collection Scandal Photo

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CASE 09

Japan Fertilizer & Ammonia Producers Association

Measures to prevent coated fertilizer shells from leaching out of the field

In the field, coated fertilizers are used to control the leaching of ingredients by coating the surface of the fertilizer.
The characteristics of these fertilizers are controlled elution, high composition, and extremely low moisture absorption, and they are effective in reducing the workload by reducing the number of times fertilizer needs to be applied and in the effective use of resources by reducing the amount of fertilizer applied.
However, there is a possibility that the shell containing plastic may be spilled.

The Japan Fertilizer and Ammonia Producers Association is calling for companies to put a cautionary display on fertilizer bags to prevent the shells from spilling out. In cooperation with related organizations, we are informing farmers about the use of fertilizers to prevent the release of coated fertilizer shells (avoid forced water drainage and adjust the water level by natural water reduction, use shallow water for raking, use raked fields to manage the edges of the fields, and follow fertilizer application standards without over-applying fertilizers).

Specific example of fertilizer container packaging

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CASE 10

THE JAPAN PLASTICS INDUSTRY FEDERATION

Activities for controlling outflow of resin pellets, etc.

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 NGOs (JEAN) 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 industry and prevent leaks.

Reference materials
Request for thorough prevention of resin pellet leakage

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CASE 11

Plants Laboratory Inc.

Development of medium for hydroponics using marine-biodegradable plastic

Currently, urethane media, which are widely used in Japan for hydroponics, are easily torn off when being separated from roots after plant harvesting, and they deteriorate due to ultraviolet rays, so there is a concern that small pieces are infiltrating the soil and drainage.

Plants Laboratory Inc. is developing a medium for hydroponics that uses marine-biodegradable resin. This makes it possible to reduce the impact of environmental outflow while offering cost benefits such as a reduction in labor costs related to separating the media from roots.

Germination state with urethane

Urethane that intertwines with roots

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CASE 12

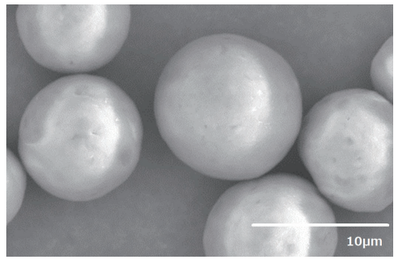
Rengo Co., Ltd.

A cellulose-based replacement for microplastic beads

Viscopearl (porous cellulose beads) is a biodegradable spherical particulate material made of 100% cellulose derived from wood pulp. With a wide range of particle sizes, from 3 μm to 4 mm, it has a high affinity for both water and oil as well as chemical resistance and heat resistance, therefore it can be used for a variety of purposes, such as detergents, cosmetics ingredients, abrasives, and fillers.

It is also marine-biodegradable (with “OK Biodegradable MARINE” certificate), consequently it has the potential to contribute to a reduction in marine microplastic waste by substituting for plastic particles that could flow out into the sea.

Viscopearl



Electron Micrograph

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