Initiatives to Help Achieve the SDGs

The SDGs and Realizing KAITEKI

The Sustainable Development Goals (SDGs) are a set of development goals for international society as a whole to pursue from 2016 to 2030 that were adopted as part of a resolution titled “Transforming our world: the 2030 Agenda for Sustainable Development” at the UN Sustainable Development Summit in September 2015. The SDGs comprise 17 goals and 169 targets for realizing a sustainable world. Governments and civil society, as well as the private sector, including corporations, are expected to utilize their resources and coordinate to help achieve the SDGs. The roles global corporations, in particular, are expected to fulfill, given their businesses spanning multiple countries and significant influence, is growing.

In accordance with its vision of realizing KAITEKI, the sustainable well-being of people, society and our planet Earth, the Mitsubishi Chemical Holdings (MCHC) Group adopted improving sustainability as one of its management axes in 2011. We aim to not only help solve environmental and social issues but contribute to the sustainable development of society and the planet. As such, we believe that many aspects of our vision of realizing KAITEKI parallel the SDGs.

Furthermore, MCHC has laid out how the SDGs relate to its important management issues (materiality) and MOS (Management of Sustainability) Indices—which it uses as key performance indicators to enhance sustainability—and has linked these issues and indices with SDG efforts.

Mitsubishi Chemical’s Initiatives

As a member of the MCHC Group, Mitsubishi Chemical (MCC) has made realizing KAITEKI its vision and declared that it will seek to address societal issues by creating new value and providing said value to customers as solutions, thereby sustainably growing in concert with society. As a result, many of our initiatives, including the products and services we provide, contribute to the realization of the SDGs.

The *MCC Sustainability Report 2021* features the following five items, chosen as representative examples of MCC’s wide-ranging initiatives that contribute to realizing KAITEKI and the SDGs.

Responding to the COVID-19 Pandemic: Social Contribution through Diverse Products and Technologies	 SDG 3: Ensure healthy lives and promote well-being for all at all ages
Building a Circular Economy with the Aim of Sustainable Growth	 SDG 13: Take urgent action to combat climate change and its impacts
Plant-Derived, Biodegradable Plastic BioPBS™	 SDG 12: Ensure sustainable consumption and production patterns
Structural Repair and Strengthening Carbon Fiber Fabric REPLARK™	 SDG 11: Make cities inclusive, safe, resilient and sustainable
Decentralized Water Treatment & Supply System	 SDG 6: Ensure availability and sustainable management of water and sanitation for all

Responding to the COVID-19 Pandemic: Social Contribution through Diverse Products and Technologies

Relevant SDG

SDG 3: Ensure healthy lives and promote well-being for all at all ages

Seeing the strain that the COVID-19 (novel coronavirus) pandemic has put on the medical system, we at Mitsubishi Chemical (MCC) asked ourselves how we could contribute using the industrial materials and technologies of the MCC Group. Leveraging ideas and networks from within the Group, and the diversity and versatility of its chemicals, we have provided the following products to society.

Contributing through Products

Plastic Gowns

We developed plastic gowns based on instructions from the Ministry of Health, Labour and Welfare by adapting polyethylene rain ponchos. We added thumb holes at the ends of the sleeves to prevent them from riding up as well as a perforated line down the back to make it easy to take the gowns off, reducing the risk of contact-based infection. Furthermore, each gown weighs less than 100 grams, helping to reduce waste when used gowns are thrown away.

Plastic gown

Face Shields

MCC created face shields by applying polyester sheet manufacturing technologies used to produce food packaging trays along with curved creasing technologies developed for cosmetics case processing.

MCC was quick to donate and supply plastic gowns and face shields to medical institutions, helping to prevent the spread of infection in hospitals and clinics.

Standard face shield

Glare reduction face shield

Hi-Selon™ Laundry Bags

Laundry bags made from our water-soluble film Hi-Selon™ allow users to wash used sheets or clothing without touching them. Their use, mainly in hospitals, helps prevent infection.

Hi-Selon™ laundry bag

SHINKOLITE™ Cast Acrylic Sheet Partitions

MCC offers SHINKOLITE™ continuous cast acrylic sheets that are used to make partitions that help prevent the airborne spread of COVID-19 in daily life. Due to their excellent transparency, these products are being used in a wide array of settings, such as at the registers and counters of stores and restaurants; in offices; service counters at public service facilities; and on TV filming sets.

Standing partition made of SHINKOLITE™ cast acrylic sheet

HISHITANK™ Water Tanks

HISHITANK™ is a water tank made of fiber-reinforced plastic developed primarily to provide clean drinking water and featuring outstanding performance in terms of seismic resistance, hygiene, durability and workability. These tanks have been installed by the Nippon Foundation at facilities built to combat the COVID-19 pandemic. They have also been installed at quarantine lodging facilities built by the Hong Kong government specifically for COVID-19 patients and the Osaka Corona Severe Center to help ensure an adequate supply of hospital beds.

HISHITANK™ water tanks

Wasaouro™ Antibacterial, Anti-Mold Film

Wasaouro™ is an antibacterial, freshness-maintaining agent, the principal component of which is allyl mustard oil (allyl isothiocyanate, “AIT”), the main compound responsible for the spicy flavor of wasabi and Chinese mustard. AIT-impregnated transparent films gradually release AIT, providing an easy and safe way of maintaining food freshness and quality by suppressing the growth of bacteria and mold. This product is well suited to maintaining the quality of products with short shelf lives, such as boxed lunches, and opportunities for its use have grown as demand for takeout has grown during the COVID-19 pandemic.

Wasaouro™ antibacterial, anti-mold film

Anti-Virus Spray and Anti-Virus Wet Wipes

The MCC Group offers the anti-viral, anti-bacterial[1] products Anti-Virus Spray and Anti-Virus Wet Towel (wet wipes). The spray is made for use on home fixtures and furniture, such as doorknobs, tables and sofas, as well as clothing, curtains and other textiles, while the wet wipes are ideal for use on doorknobs and other objects on while on the go. The long-lasting anti-viral, anti-bacterial ingredient (quaternary ammonium salts) these products contain fends off viruses and bacteria and remains effective even after drying for approximately 20 days,[2] longer than previous products.

1 Not effective on all viruses and bacteria.
2 Effects and their duration may vary depending on usage conditions.

Anti-Virus Spray

Anti-Virus Wet Towel

Responding to the COVID-19 Pandemic: Social Contribution through Diverse Products and Technologies

Main Products Helping Combat the Spread of COVID-19 and Related Group Companies

Plastic gowns	J-Film Corporation
Face shields	J-Film Corporation
Laundry bags	MCC Trading Co., Ltd.
Partitions made from SHINKOLITE™ cast acrylic sheet	Mitsubishi Chemical Methacrylates Ltd.
HISHITANK™	Mitsubishi Chemical Infratec Co., Ltd.
Wasaouro™	Mitsubishi Chemical Corporation
Anti-Virus Spray	Shinryo Corporation
Anti-Virus Wet Wipes	Shinryo Corporation

Other Forms of Contribution

IP Open Access Declaration Against COVID-19

MCC joined the IP Open Access Declaration Against COVID-19 in May 2020. The declaration is a pledge to not assert any patent right, utility model right, design right or copyright against any development, manufacture, sale or other related activity carried out for the purpose of stopping the spread of COVID-19. MCC declared that, with regard to activities carried out for the sole purpose of stopping the spread of COVID-19, it would temporarily suspend its assertion of patent rights, utility model rights, design rights and copyrights and refrain from seeking compensation for their use.

For Children

With school closures and efforts to stay home to prevent the spread of infection, many children are spending more time than usual at home. To make this time more enjoyable and help spark an interest in chemistry, since May 2020, MCC has been soliciting chemistry experiment videos from its employees and posting them to the MCC Group internal portal site. Employees submitted more than 10 videos that encourage children to think, experiment and learn in a fun way using household materials and provide explanations of chemical phenomena. Beginning in July 2020, we published some of these on YouTube.

Experiment video

Providing a Vaccination Site Venue and Supplies

MCC's Toyama Plant allowed Toyama City to use the KAITEKI CHEMICAL Gymnasium as a group vaccination site free of charge to help increase the COVID-19 vaccination rate. In addition, we donated 17,000 high-efficiency N95 face masks that MCC's Shiga Plant had stockpiled to medical facilities in Nagahama City.

Going forward, while working in coordination with government and industry organizations, the MCC Group will continue to solicit ideas covering a wide range of topics from employees, seeking to combine its diverse products and technologies to proactively develop new products that will help combat the spread of COVID-19.

Building a Circular Economy with the Aim of Sustainable Growth

Relevant SDG

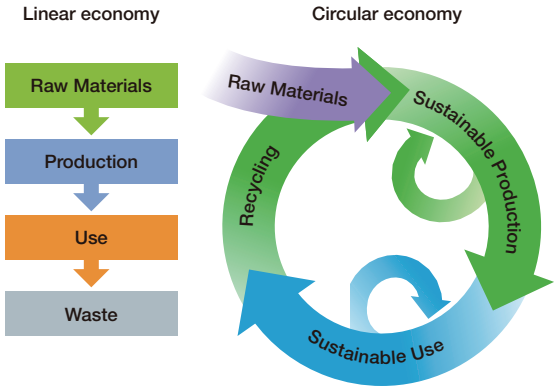
SDG 13: Take urgent action to combat climate change and its impacts

Offering New Business Solutions by Pursuing a Circular Economy

The world today faces numerous serious challenges, such as climate change and various problems arising from population growth. Chemical technologies have tremendous potential to solve a wide range of social issues. Mitsubishi Chemical (MCC), as a member of society and as an integrated chemical company, has long faced such issues head-on.

Particularly in recent years, demand from customers for sustainable products has been growing constantly in response to tightening environmental regulations in various countries. MCC aims to meet the demands of society while achieving sustainable growth by transitioning from a traditional one-way linear economy of "take-make-waste" to a circular economy (CE) based on the effective use of resources, including recycling, and the use of renewable raw materials.

Below, we highlight some of the concrete steps we are taking, such as the establishment of a division dedicated to the promotion of a CE and the implementation of initiatives to tackle the issues of plastic waste and climate change.



Offering Solutions from a Global Perspective in Collaboration with Value Chain Partners

In April 2020, MCC established the Circular Economy Department (changed to the Circular Economy Division as part of organizational reforms in April 2021; hereinafter, the "CE Division") to reinforce initiatives that address social issues related to sustainability. While work in each business domain to solve sustainability-related issues is ongoing, the CE Division operates from a global perspective and scale across business domains and with value chain partners to pursue CE-related solutions and develop them into businesses. The division will also actively promote collaborations with such business partners as academia and start-ups.

The CE Division handles CE-related issues on a company-wide basis. The division's activities include identifying CE-related issues and formulating strategies at the company-wide level, promoting the development of solutions into businesses and implementing sustainability management to reduce the impact on the environment of our business activities, including greenhouse gases (GHGs) and wastewater emissions. In addition, the division will gather and provide information on sustainability-related policy in various countries and support dialogue about CE between related departments and customers.

Building a Circular Economy with the Aim of Sustainable Growth

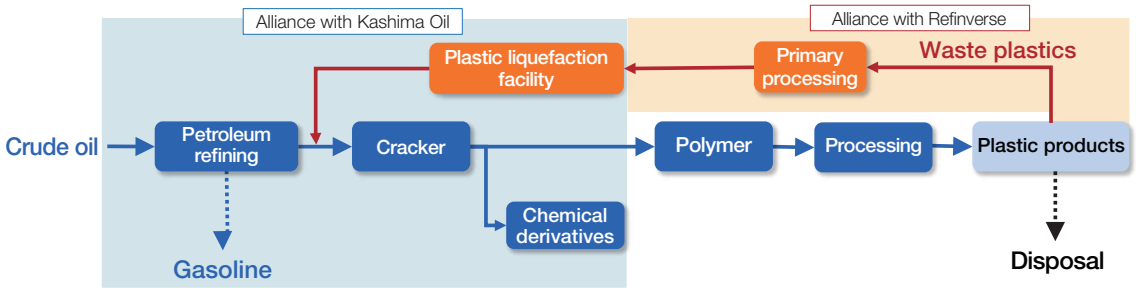
Advancing Partnerships to Build a Plastic Recycling Scheme

Recycling is extremely important to the transition from a linear economy to a circular economy.

Plastic recycling is broadly divided into two approaches: (1) mechanical recycling, in which collected used plastic is melted down and remolded for reuse, and (2) chemical recycling, in which it is decomposed into monomers or intermediate materials for repolymerization or broken down into oil or gas for use as a raw material in chemical production. MCC is advancing partnerships with a variety of partners that include technology development based on both approaches. In doing so, we are reinforcing efforts to build a scheme for recycling plastic waste —which have conventionally been simply incinerated or buried in landfills—into resources and raw materials. Featured below are some of the chemical recycling initiatives we are implementing in collaboration with value chain partners.

Plastic-to-Oil Conversion

MCC and ENEOS Corporation jointly established Kashima Complex LLP in 2019. Through this partnership, the companies are working toward the commercialization of the chemical recycling of plastic waste. Specifically, the two companies are constructing a plastic-to-oil conversion facility at MCC's Ibaraki Plant. The facility will commence operation in 2023 with an annual processing capacity of 20,000 tons, the largest of its kind in Japan. The conversion process at the facility will be carried out with supercritical water treatment technology from U.K.-based Mura Technology Limited. The recycled oil produced will be used as a raw material in existing oil refineries and naphtha crackers owned by ENEOS and MCC. It will be converted to petroleum products, chemicals and various plastic products, and, in this way, the two companies aim to realize highly efficient chemical recycling. In addition, the procurement of raw material plastic waste will be carried out in collaboration with Refinverse, Inc., with which MCC formed a capital and business alliance in August 2020.



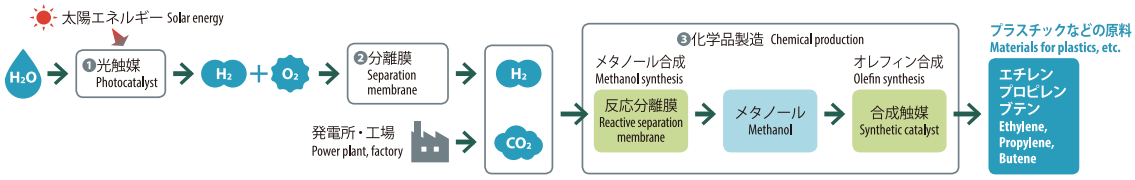
Chemical Recycling of Acrylic Resin

MCC and Mitsubishi Chemical Methacrylates Ltd. have for some time been investigating the recycling of polymethyl methacrylate (PMMA, or acrylic resin). In Europe, we are studying methods of recycling using existing technologies. In Japan, we constructed a new demonstration facility within the Osaka site of Microwave Chemical Co., Ltd., our partner for acrylic resin recycling technology study, in June 2021. Tentatively aiming to begin operations in 2024 in Europe and Japan based on these respective approaches, we are accelerating work toward the construction of acrylic resin recycling plants.

Acrylic resin is a plastic product with excellent transparency and light resistance used for a wide range of applications, including vehicle lamp covers, sign boards, aquarium water tanks, paints and construction materials. In particular, since the start of the COVID-19 pandemic, demand for acrylic resin sheets used for protection against droplet infection has increased. Going forward, we are considering sourcing acrylic resin for recycling not only from waste generated by our plants, but from a broader market. As part of these efforts, we have partnered with Honda Motor Co., Ltd. to jointly implement demonstration testing of systems for the chemical recycling and reuse of acrylic resin collected from the taillights and other parts of end-of-life vehicles.

Reducing GHGs through an Artificial Photosynthesis Project

Artificial photosynthesis is a promising approach to reducing GHGs that uses CO_2 emitted from power plants and factories as a raw material for chemical products. Since 2012, MCC has participated as a member of ARPChem,[1] a NEDO[2] project aimed at realizing artificial photosynthesis, and is involved in the development of core technologies for all of the following three processes.



1. A photocatalyst splits water into gaseous hydrogen and oxygen; 2. the hydrogen is then safely separated out of the mixed hydrogen and oxygen gas using a separation membrane; and 3. the hydrogen is used as a raw material together with CO_2 recovered from the gas emissions of power plants or factories to produce chemical products.

The project's target for photocatalyst solar energy conversion efficiency has been set at 10%. In fiscal 2019, an efficiency of 7% was achieved in a laboratory setting. Outdoor demonstrations of the water splitting systems began in fiscal 2020.

1 ARPChem: Japan Technological Research Association of Artificial Photosynthetic Chemical Process, comprising INPEX CORPORATION, TOTO LTD., Japan Fine Ceramics Center, Fujifilm Corporation, Mitsui Chemicals, Inc., and MCC.
2 NEDO: New Energy and Industrial Technology Development Organization

Building a Circular Economy with the Aim of Sustainable Growth

Establishing a Long-term Vision for the Chemical Industry

MCC and the Center for Global Commons (CGC) at the University of Tokyo have formed an industry-academia partnership with the aim of formulating a long-term vision of the chemical industry's approach to sustainability with an eye toward society in 2050.

To ensure the sustainability of global environmental systems, CGC aims to scientifically demonstrate pathways for the fundamental transformation of socio-economic systems based on modelling and indices. In collaboration with a wide range of stakeholders, including private enterprises, CGC aims to drive this fundamental transformation through international cooperation.

MCC and CGC began joint research on April 1, 2021 to identify the social needs (particularly in the areas of products, services and social systems) of 2050, as well as those expected to emerge along the way by 2030 and 2040, and, given such needs, the role the chemical industry must play in protecting the Global Commons.[3]

Specifically, we will outline a vision for the chemical industry that encompasses reducing the environmental impact of the chemical industry itself as well as the role it must play and issues it must solve in relation to other industries and consumers in order to achieve socio-economic sustainability within the Planetary Boundaries.[4] In particular, we are researching ways that the chemical industry can contribute to the transition of key economic systems in such areas as production and consumption, energy, food and cities. By bringing together outside expertise and knowledge, this research is able to gain insights from the latest initiatives in Europe and elsewhere in the world to build and utilize quantitative models for key chemical products, from their raw materials to their recycling or disposal, and thereby elucidate the path forward for Japan's chemical industry. The results of this research will be broadly shared with society to accelerate the realization of socio-economic sustainability.

3 Global Commons: The global environmental system upon which the sustainable development of humankind is founded.
4 Planetary Boundaries: The nine processes that stabilize the global environmental system (climate change, biodiversity, nitrogen and phosphorus cycles, etc.), in which thresholds that must not be crossed for humanity to develop sustainably are defined. Crossing these thresholds increases the risk of large-scale and irreversible environmental change. Climate change is in the uncertainty zone, and the biodiversity and nitrogen and phosphorus cycles are considered to have crossed the thresholds.

Plant-Derived, Biodegradable Plastic BioPBS™

Relevant SDG

SDG 12: Ensure sustainable consumption and production patterns

Striving toward Sustainable Production

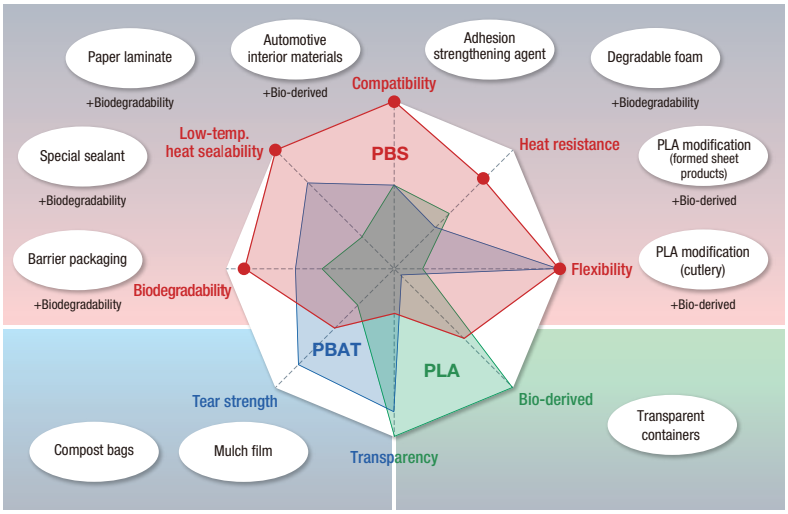
We are now facing such global-scale risks as accelerating climate change, the depletion of natural resources, disparities in water resource distribution, expanding and graying populations, and food and agricultural issues. Given this critical situation, as a chemical company, we believe it is our mission to realize, through innovation, the efficient use of natural resources and energy, the utilization of renewable resources and the reduction of environmental burden and to thereby enhance environmental and social sustainability.

Initiatives to replace non-renewable petroleum with renewable biomass as the raw material for plastic production are helping to more efficiently use resources and greatly contribute to ensuring sustainable production, part of one of the SDGs. At the same time, making plastics biodegradable while retaining their useful properties makes it easier for them to break down in the environment, helping to reduce environmental burden. With BioPBS™, a renewably sourced and biodegradable product, Mitsubishi Chemical (MCC) has developed a plastic that offers both of these unrelated attributes.

Features of BioPBS™

Polybutylene succinate (PBS) is an aliphatic polyester resin made from succinic acid and 1,4-butanediol, two raw ingredients typically manufactured from petroleum. In contrast, BioPBS™ is made with succinic acid derived from plant materials, a renewable resource. Its excellent biodegradability at ambient temperature—ultimately breaking down into water and CO_2—sets it apart from other biodegradable plastics like polylactic acid (PLA) and polybutylene adipate terephthalate (PBAT). BioPBS™ also boasts such outstanding qualities as low-temperature heat sealability, compatibility with other materials, heat resistance and flexibility. Moreover, many properties that BioPBS™ does not have by itself can be achieved when it is used in composites with other resins and materials.

Characteristics of PBS



Plant-Derived, Biodegradable Plastic BioPBS™

Applications of BioPBS™

BioPBS™ is manufactured and sold by PTT MCC Biochem Co., Ltd., a joint venture of PTT Global Chemical Public Company Limited (previously Petroleum Authority of Thailand) and MCC. Furthermore, MCC is advancing the development, manufacture and sale of compounds that impart new functions to BioPBS™, leveraging its excellent compatibility with other materials and biodegradability. BioPBS™ is currently being used in applications including those below.

Agricultural Mulch Film

Agricultural mulch film is used to cover the rows of soil in which agricultural products grow, helping prevent insect and weed infestation, stabilize ground temperature, maintain soil moisture and prevent fertilizer runoff. Because of the wide range of useful effects they offer, such films are in widespread use. However, after crops are harvested, ordinary mulch films must be collected from the fields and disposed of as waste plastic or incinerated. The biodegradability of BioPBS™ is thus of great use in this application. Agricultural mulch film made with BioPBS™ need not be collected after the harvest, and can instead simply be plowed into the soil, where it naturally breaks down. This helps achieve sustainable production, part of one of the SDGs, while contributing greatly to labor saving in agriculture.

Use in agricultural mulch films

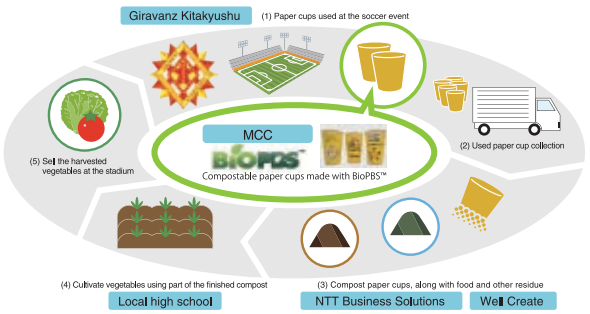
Paper Cups and Straws

Shopping bags, food containers and straws are some of the most prevalent examples of disposable plastics. MCC has made paper cups laminated with BioPBS™ and straws made from BioPBS™ compounds.

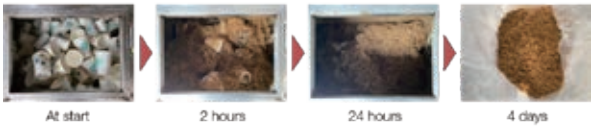
In 2021, MCC implemented a verification test as a step toward realizing a circular economy using compost derived from paper cups made with BioPBS™.

For the verification test, MCC supplied paper cups made with BioPBS™ for a soccer event hosted by Giravanz Kitakyushu, a Japanese soccer club. The used paper cups were then collected and composted together with food residue at composting facilities. A portion of the resulting compost was used to cultivate vegetables at a local high school, which will be the harvested and sold at the soccer stadium.

MCC aims to contribute to the realization of a circular economy by actively building recycling and composting systems in collaboration with various companies and municipalities.



Overview of the verification test



Composting process at the compost facilities

Coffee Capsules

Capsule coffee makers have rapidly grown in popularity in recent years. These machines heat water at high pressure then force it through the ground coffee beans, which are kept fresh inside a capsule, to brew coffee. For this to work, the capsules need to have a number of attributes, including heat resistance, impact resistance and sealability to preserve flavor. Because it meets these needs, BioPBS™ is used as a material for coffee capsules.

Use in a coffee capsule

The heat and impact resistance of BioPBS™ composites are useful in this application, but the biodegradability of BioPBS™ plays a major role as well. Because used coffee capsules contain wet coffee grounds, they are difficult to recycle as plastic. However, if they are made with biodegradable BioPBS™ composite, used capsules can be composted, a method of disposal with minimal environmental impact. By providing such products, we aim to enrich lifestyles while contributing to sustainable production, part of one of the SDGs.

Working toward the SDGs

MCC continues to advance R&D aimed at eventually producing the raw ingredients for PBS, including 1,4-butanediol, entirely from plants. We also aim for even higher biodegradability to better realize sustainable consumption and production patterns, one of the SDGs. MCC is putting its full strength—including advancing R&D, establishing production technologies, ensuring quality that meets demands, developing markets, and developing global business—into realizing these goals.

Structural Repair and Strengthening Carbon Fiber Fabric REPLARK™

Relevant SDG

SDG 11: Make cities inclusive, safe, resilient and sustainable

Targeting Sustainable Infrastructure

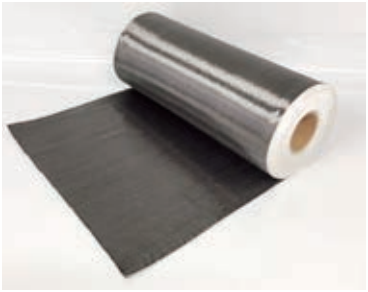
Recent years have seen numerous heavy rains, earthquakes, volcanic eruptions, tsunamis, droughts and other natural disasters around the world. Typhoons, heavy rains, and the subsequent flooding are becoming more frequent and more severe, and damage from earthquakes is unending. In addition to the harm they inflict in terms of human life, the economic toll of such disasters is a major barrier to the realization of a sustainable society. Natural disasters significantly impact highly developed countries and, in countries where infrastructure is underdeveloped, can wreak even greater harm.

As bridges, expressways, tunnels and other such infrastructure components age, their safety becomes harder to ensure; incidents involving collapsing or failing infrastructure in and outside Japan have been occurring one after another. Furthermore, the decreased utility of aging structures and the expense of repairing and strengthening them are major social issues.

The Mitsubishi Chemical (MCC) Group provides a range of products and services that aid in addressing the critical state of infrastructure and contribute greatly to the realization of the SDG “Make cities inclusive, safe, resilient and sustainable.” One such product is the structural repair and reinforcement carbon fiber fabric REPLARK™ offered by Mitsubishi Chemical Infratec Co., Ltd.

Features of REPLARK™

Carbon fiber boasts many advantageous features: It has a specific gravity just 1/4 that of iron, yet approximately 10 times the strength of steel, and it is highly chemically stable, making it resistant to salt damage. REPLARK™ is a repair and reinforcement material made of unidirectional carbon fiber for steel and concrete structures. As a fabric, REPLARK™ can be applied to structures of various shapes and offers excellent workability. The grade of REPLARK™ made with PAN-based carbon fibers can be used to enhance the load bearing capacity of such structures as bridge columns, while the high-elastic-modulus grade made with pitch-based carbon fibers can greatly reduce rebar stress. In addition to REPLARK™ fabric, we offer a range of formed carbon-fiber reinforced polymer (CFRP) products, such as e-Plate (strips) or LEADLINE™ (rods), to meet the needs associated with various applications.



REPLARK™

e-Plate

LEADLINE™

Applications of REPLARK™

REPLARK™ provides the following functions when used with existing structures.

- It reinforces bridge girders against bending and enhances the fatigue durability of bridge deck slabs
- It improves the seismic resistance of bridge columns and other structures by absorbing energy from earthquakes
- It prevents concrete stripping from tunnel surfaces

In addition to offering the lightness, strength and elasticity of carbon fiber, REPLARK™ is simple to install; fabric impregnated with epoxy resin need only be applied to the structure surface. As such, it offers the following advantages for repairing and strengthening structures.

- Because it is lightweight and simple to install, carrying and handling the necessary materials at the worksite is easy
- It enables repairs in tight spaces where maneuvering and installing steel components is difficult
- It adds almost no weight to the structure being repaired or strengthened, helping reduce the load on the existing structure

The development of REPLARK™ goes back to the 1980s. Recognition of the need for such a product and its usefulness has gradually increased, and today it is starting to be used not only in Japan, but also in Southeast Asia and Europe.

Installation on Genta Bridge

Genta Bridge, located in Tottori City, Tottori, was completed in 1951. While in relatively good repair, the bridge was narrow, making passage difficult for large vehicles, and its load capacity was no longer sufficient due to the increasing size of vehicles on the road.

To address these issues, Tottori Prefecture sought to broaden and strengthen the bridge, but doing so by conventional methods would significantly increase the bridge's weight, requiring large-scale construction. Instead, the bridge's reinforced concrete girders were replaced with steel; external cables and REPLARK™ carbon fiber fabric were used for strengthening; and LEADLINE™ carbon fiber rods were used to strengthen the deck slabs. As a result, the overall cost was approximately halved from what it would have been using conventional construction methods. In recognition of these achievements, the bridge received the Japan Society of Civil Engineers 2014 Tanaka award.

Genta Bridge under construction

Structural Repair and Strengthening Carbon Fiber Fabric REPLARK™

Test of Bridge Deck Slab Strengthening Using e-Plate

In recent years, to save on-site labor, the use of e-Plate carbon fiber-reinforced plastic strips (carbon fiber yarn processed into strips at a plant) to strengthen deck slabs has been increasing. This construction method entails bonding e-Plate strips that have been impregnated with epoxy resin at a plant to the underside of deck slabs. Unlike deck slab underside reinforcement using REPLARK™, this method does not cover the entire underside of the slab, leaving the concrete visible, which makes it easier to observe the condition of the slab after reinforcement. The Public Works Research Institute's Civil Engineering Research Institute for Cold Region (based in Hokkaido) carried out a wheel load running test on slabs reinforced with this method and found that fatigue durability showed a more than tenfold improvement compared with unreinforced slabs.

Wheel load running test

Deck slab reinforced with e-Plate

Working toward the SDGs

As expressed by the SDG "Make cities inclusive, safe, resilient and sustainable," building safe, reliable infrastructure is among the most important tasks we face. However, securing the funding and manpower needed to renovate infrastructure remains difficult. The MCC Group strives to find solutions to these two difficult and conflicting issues through innovation and global business development.

Decentralized Water Treatment & Supply System

Relevant SDG

SDG 6: Ensure availability and sustainable management of water and sanitation for all

Safe Water for the World

While approximately 70% of the Earth's surface is ocean, fresh water accounts for just 2.5% of all water on the planet. Most of this fresh water is in glaciers and ice sheets, groundwater or otherwise difficult to access; readily available surface water[1] in such forms as lakes and streams is estimated to make up just 0.01% of all water on Earth.

Furthermore, this readily usable water is unevenly distributed. According to a report published in June 2019 by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) Joint Monitoring Programme for Water Supply, Sanitation and Hygiene, some 2.2 billion people around the world do not have safely managed drinking water services, 4.2 billion people do not have safely managed sanitation services and 3 billion lack basic handwashing facilities. Achieving the SDG "Ensure availability and sustainable management of water and sanitation for all" will bring immeasurable benefits to people and society, saving lives by improving public sanitation, thereby helping prevent the spread of infectious disease and reducing infant mortality, while also reducing the gap between rich and poor, creating educational opportunities and contributing to regional economic development.

Moreover, given the frequency of major natural disasters around the world, securing water supply lifelines in times of disaster is a major issue facing developed countries, as well.

Mitsubishi Chemical Aqua Solutions Co., Ltd. (MCAS; formerly Wellthy Corporation) has been working to solve these problems for more than 20 years. Focusing on groundwater, which accounts for 0.76% of the planet's water, MCAS strives to contribute to the supply of safe water using the decentralized water treatment & supply systems it has developed. These systems are currently supplying water—an essential for daily life—both in Japan and overseas.

1 Surface water: Water that originates mainly from precipitation and is present entirely above ground in such bodies as rivers and lakes.

What is a Decentralized Water Treatment & Supply System?

Capable of processing water from a wide range of sources, MCAS's decentralized water treatment & supply systems employ the company's accumulated membrane filtration technologies. MCAS handles everything from development and manufacture to the management and maintenance of these systems. MCAS systems are mainly used with groundwater in Japan and with surface water overseas. Their compatibility with diverse water sources gives the systems a major advantage. In addition, these systems offer the following advantages.

- The system can be installed on an area the size of a few parking spaces and requires less investment than a large-scale centralized water purification plant
- Customers can select the optimal system configuration for the type and characteristics of their water source and the usages and required supply capacity of treated water
- A remote monitoring system ensures a safe and stable water supply
- The system can reduce water supply costs

Decentralized water treatment & supply system

Decentralized Water Treatment & Supply System

Furthermore, because these water supply systems are decentralized and enable local production for local consumption, they also offer the following merits.

- Construction does not take long, so the lead time from the start of installation to the start of water supply is short
- Maintenance requires little cost or labor
- The training necessary for upkeep and management is simple
- As a secondary water supply in addition to public water supply, the system can provide a water supply lifeline that is resilient to disasters
- The system can fill gaps in public water supply systems in rural or remote areas of developing countries

Applications of the Decentralized Water Treatment & Supply System

MCAS's decentralized water treatment & supply system business is aimed at realizing safe, stable water supply for everyday use, helping secure an uninterrupted water supply at times of natural disaster and supporting the business continuity of its customers.

Clean Water and Agriculture Promotion Project in Kenya

MCAS is working with the United Nations Development Programme (UNDP) on a project to supply clean water to a community of approximately 40 households in Machakos County, Kenya.

Because there is no electricity supply in the community, we installed a slow sand filtration system (a filtration system that uses gravity) that requires no power and only simple maintenance. This system purifies water taken from a nearby canal for use by the local residents. At the same time, we have developed a clean water business model whereby local residents can sell purified water to their neighbors to secure a cash income.

In addition to supplying clean water, we are focusing efforts on promoting local agriculture. By installing facilities for drip irrigation (in which water is supplied in small amounts only where needed) and reusing activated carbon previously employed in water filtration as a soil conditioner, the project is improving water use efficiency and reducing waste. With an eye to promoting traditional leafy vegetables that offer high added value but are not currently grown in the area as possible cash crops, we aim to help expand the cultivation of cash crops rooted in the area and thereby increase incomes in the community as a whole.

These efforts are helping local residents achieve economic independence and creating educational opportunities. Furthermore, through such knock-on effects as the health benefits to local residents of eating highly nutritious traditional vegetables, we are contributing to the world via the supply of water.

Clean water project in Kenya

Groundwater Membrane Filtration System

Our groundwater membrane filtration system is a decentralized water supply system that uses the sophisticated membrane filtration treatment that MCAS has developed to process groundwater into safe, reliable drinking water. Used as a secondary water source alongside a public water utility, this system can provide a water supply lifeline during times of disaster. The system offers the following merits.

- The system facilitates operational continuity in times of disaster, most notably at medical institutions and nursing care facilities, where water supply is essential, as well as at retail facilities, hotels, schools and other important public facilities, and at factories
- The system enables social contribution by enabling the user to supply neighboring residents with water when public water supply is cut off, such as at times of disaster
- Using groundwater in the course of regular operations can help reduce water utility costs
- By using groundwater, which has a stable temperature year-round, the system can increase cooling tower efficiency in the summer and fuel efficiency for hot water supply in the winter, reducing both cost and environmental burden

In areas where public water supply was cut off after the Kumamoto Earthquake in 2016 and Northern Osaka Prefecture Earthquake in 2018, these systems stayed operational. As a result, hospitals that had groundwater membrane filtration systems had no interruption in water supply and were able to continue operating. We also heard from many customers that they were able to contribute socially by providing water to nearby residents.

Working toward the SDGs

Safe water is a limited resource; even those of us who enjoy its benefits every day are reminded how precious it is when a natural disaster strikes. As such, although achieving the SDG “Ensure availability and sustainable management of water and sanitation for all” will be extremely difficult, its realization will help not only ensure safety and peace of mind in everyday living for people around the world, but contribute greatly to the sustainable development of people and society.

We at the MCC Group will persistently work toward the achievement of this challenging task through innovation and global business development.