




# Building a Circular Economy with the Aim of Sustainable Growth

**13** CLIMATE ACTION



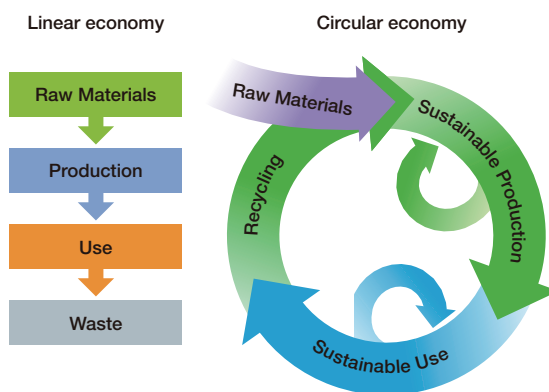
**Relevant SDG**  
SDG 13: Take urgent action to combat climate change and its impacts

## Offering New Business Solutions by Promoting a Circular Economy

The world today faces numerous serious challenges, such as climate change and the various problems arising from population growth. Chemical technology has 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 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 the Circular Economy Department (CE Department) and the implementation of initiatives to tackle the issues of waste plastic and climate change.



## Offering Solutions from a Global Perspective

In April 2020, MCC established the CE Department to reinforce initiatives that address social issues related to sustainability. While we have been working to solve sustainability-related issues in each of our businesses, the CE Department will operate with a global perspective and scale across business domains to promote CE-related solutions and develop them into businesses. The department will also actively promote collaborations with business partners, academia, start-ups, and other partners.

The CE Department will handle CE-related issues on a company-wide basis. The activities of the department will 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 environmental burden generated by our business activities, including greenhouse gases (GHGs) and wastewater emissions. In addition, the department will gather and provide information on sustainability-related policy in various countries and provide support for dialogue about CE with customers.

## Advancing Partnerships to Build a Plastic Recycling Scheme

Recycling is extremely important to the transition from a linear economy to a circular economy. The MCC Group is advancing partnerships with recycling companies that boast both waste plastic collection technologies and networks.

Plastic recycling is broadly divided into two approaches: mechanical recycling, in which collected waste plastic is melted down and reformed for reuse, and chemical recycling, in which it is decomposed into monomers or reverted to 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 waste plastics—which have conventionally been simply incinerated or buried in landfills—into resources and raw materials.

### Partnerships with Recycling Companies

Partner (Location)	Summary
Refinverse, Inc. (Tokyo)	Having started from a business that collected and transported construction-related waste for treatment, Refinverse has built an integrated system extending from waste treatment to resin production, thereby supplying a diverse range of recycled resources. Through this capital and business alliance, the two companies will combine Refinverse's know-how regarding all aspects of industrial waste with MCC's technologies and knowledge to promote the appropriate recycling and effective use of waste.
CFK <sup>1</sup> and cNXT <sup>2</sup> (Germany)	CFK has a network for collecting leftover materials generated during the molding of such intermediate materials as carbon fiber (CF) prepreg, mainly from customers in mobility-related industries, as well as technologies to recycle these materials. cNXT then sells the resulting recycled products. MCC acquired CFK through Group company Mitsubishi Chemical Advanced Materials (MCAM; Head office: Switzerland). Going forward, MCC will establish a circular chain extending from the manufacture of CF and CF composites to the collection and recycling of related products in Europe.
Minger Group <sup>3</sup> (Switzerland)	The Minger Group boasts superior proprietary recycling technologies for such engineering plastics as PEEK, PVDF and nylon as well as a material collection network that spans much of Europe. MCC acquired the Minger Group through Group company MCAM. Going forward, MCC will establish an integrated business model for engineering plastics, from manufacturing to sales, machining, collection and reuse.

<sup>1</sup> CFK: CFK Valley Stade Recycling GmbH & Co. KG

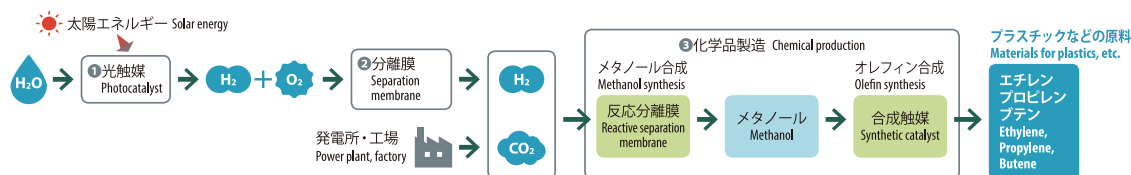
<sup>2</sup> cNXT: carboNXT GmbH

<sup>3</sup> Minger Group: Minger Kunststofftechnik AG and Minger Plastic AG



### Reducing GHGs through an Artificial Photosynthesis Project

Artificial photosynthesis is a promising approach to reducing GHGs that uses CO<sub>2</sub> emitted from power plants and factories as a raw material for chemical products. Since 2012, MCC has participated as a member of ARPChem,<sup>4</sup> a NEDO<sup>5</sup> 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<sub>2</sub> 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.

4 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.

5 NEDO: New Energy and Industrial Technology Development Organization

### Establishing a Long-term Vision for the Chemical Industry

MCC and the Center for Global Commons (CGC) at the University of Tokyo have launched 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 essential to the development of humankind, 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 plans to conduct joint research with CGC to identify the social needs (particularly in the areas of products, services and social systems) of 2050, as well as those along the way in 2030 and 2040. Given such needs, MCC plans to outline the role of the chemical industry over the long term.