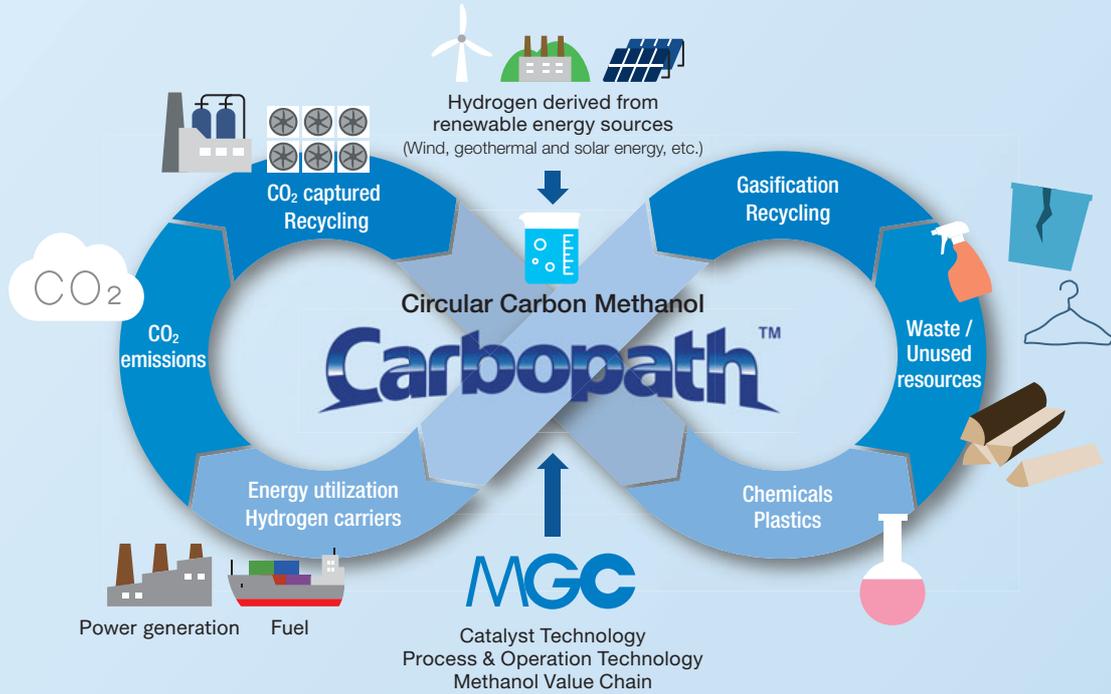


FOCUS: Aiming for Social Transformation with Carbopath™

Overview of Circular Carbon Methanol Concept

Carbopath™ Proposition for a Circular Economy through Circular Carbon Methanol



Increasing international movement towards carbon neutrality has presented the MGC Group with a new opportunity for business growth. One leading initiative is the Circular Carbon Methanol (CCM) concept, in which atmospheric CO₂ emissions, waste plastics, and others are converted into methanol, recycling them for use as chemicals or fuel, and in power generation.

MGC's history with methanol goes back to 1952, when the Company became the first in Japan to succeed in synthesizing methanol from natural gas that it had produced. Since then, we have accumulated expertise in catalyst development, synthesis technology and manufacturing over many years, along with plant operation experience. We also became one of the first to engage in research on methanol manufacturing methods using not only natural gas, but also CO₂ and hydrogen. Then, in 2020, based on the Japanese government's declaration of intent to achieve carbon neutrality by 2050, we set a new direction, aiming to make

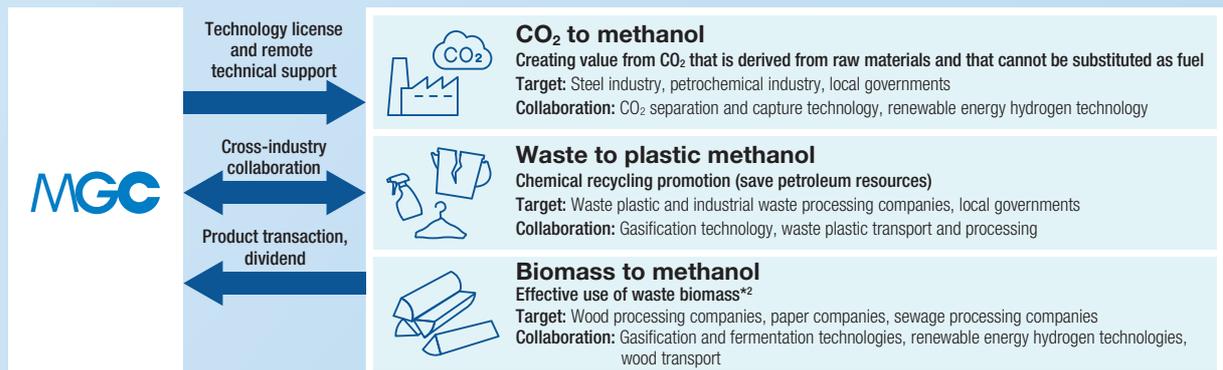
R&D on methanol made from renewable resources into a business to support our future growth.

Under this concept, MGC will invest in the methanol production business, issue technology licenses, provide operation and maintenance services, and conduct product transportation and sales. Currently, we are aiming to achieve social implementation of CCM while working to accelerate cross-industry collaboration between companies and local governments that have essential sources of renewable energy-based hydrogen and CO₂ emissions needed for realizing this concept.

In 2022, the brand name Carbopath™*1 was adopted for this concept. This brand name expresses MGC's desire to be a pioneer in promoting the CCM concept. MGC is committed to realizing carbon neutrality and a circular carbon society by promoting its environmentally advanced methanol business.

*1 Carbopath™ is derived from "carbon" and "path-finder."

Image of Collaboration with Partners



*2 Forestry thinnings, construction waste wood, food scraps, livestock dung, sewage digestion gas, etc.

Aiming to Expand Manufacturing Scale and Increase Commercial Viability in Three Phases

In Phase 1 of the production model, MGC modified a small-scale pilot facility in its Niigata Plant, and started a demonstration trial of methanol production using CO₂ and hydrogen as raw materials from July 2021.

At the same time, from 2022, we started a series of collaborations with other companies toward social implementation of CCM. First, in March of 2022, we participated in a joint project with JFE Engineering Corporation to achieve Japan's first successful production of methanol using CO₂ captured from waste incineration exhaust gas. In June, we started a feasibility study with chemical manufacturer Tokuyama Corporation regarding the commercialization of methanol production using CO₂ emissions and hydrogen generated by manufacturing

processes. In August, we collaborated with four other companies, including Kobelco Eco-Solutions Co., Ltd. in a joint effort to launch Japan's first demonstration project for the gasification and methanol conversion of waste plastics. Overseas, we started studying the manufacture and sale of CCM with Cement Australia Pty Ltd in October.

From fiscal 2025, in Phase 2, we will establish a business model that can secure appropriate profits using a plant with a production capacity of 100,000 tons. From fiscal 2030, we will increase the manufacturing scale up to the 1-million-ton level in order to increase commercial viability. We will further accelerate collaboration with companies and local governments, aiming to transform society with a circular economy.



Initiatives for Social Implementation

Fully Engaged in Preparation for First Commercial Plant

Kohei Shimada

Business Development Department,
Methanol Division,
Basic Chemicals Business Sector



Methanol is a chemical that has excellent properties for contributing to carbon neutrality. Despite this, it is generally not as well-known as hydrogen and ammonia. When the production model was first established, a considerable number of hours were spent on advertising its usefulness to people. In information dissemination, we strengthened our cooperation with other departments and participated in diligent explanations and seminars to companies and local governments in Japan and overseas, as well as issuing press releases. As a result of these efforts, we have recently seen an increase in new inquiries, showing that methanol's profile is truly rising. To establish Carbopath™ as a manufacturing and sales business required cross-industry collaboration. Therefore, we are also striving to exchange information and explore new proposals with companies from other industries and local governments.

Currently, we are promoting preparations to start up the first commercial plant for Carbopath™. We intend to use this plant as a launching point for developing new customers involved in decarbonization management, while further growing our high-environmental-value business.

Untapped Demand Related to Decarbonization of the Maritime Shipping Industry Presents a Tremendous Opportunity

Takayuki Manabe

Marketing Department, Methanol Division,
Basic Chemicals Business Sector



My role is to support the commercialization of Carbopath™, mainly by working in logistics and demand development, including offtaking methanol products manufactured through projects that we are working on with partners in Japan and overseas. In addition to business discussions with existing customers in Japan, I also focus on approaching consumers and brand owners positioned further downstream.

The methanol manufactured in Japan through this Carbopath™ concept is consumed not only in diverse applications as a basic raw material, but can also impart value to resources that have not been used until now, such as CO₂ and waste plastic. By making effective use of these resources produced in Japan, we believe we can create a new business model based on local production and consumption.

Overseas, meanwhile, we expect to see growth in demand for methanol as a carbon neutral fuel for the shipping industry, which is increasing the pace of its efforts to decarbonize. We have already begun collaborating with shipping companies and bunker supply companies. We aim to accelerate the commercialization of Carbopath™ through these initiatives.