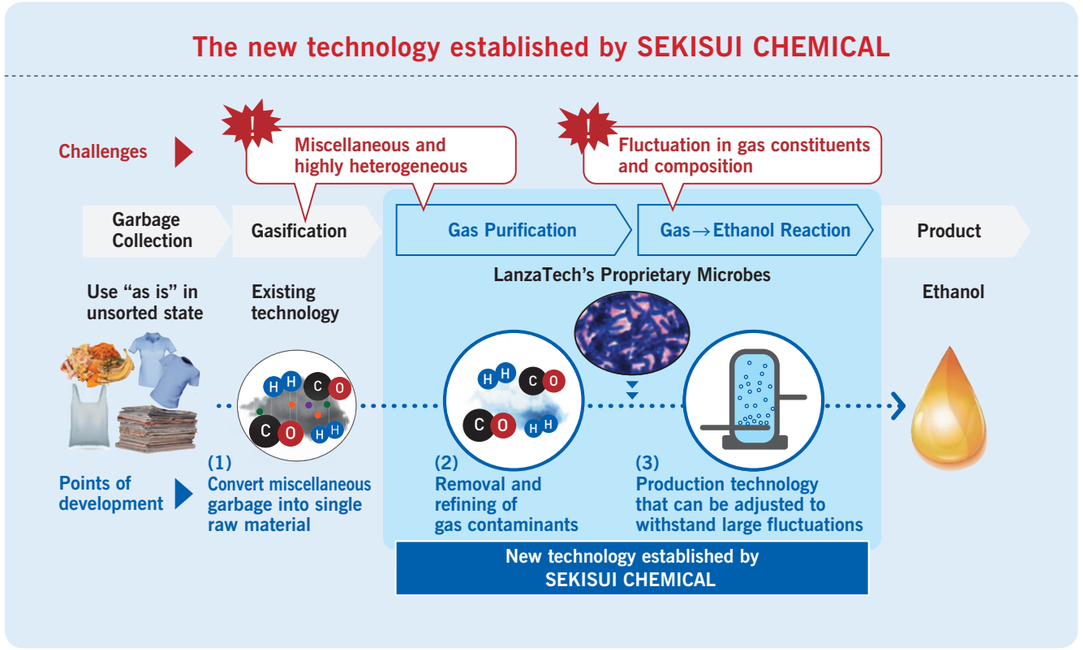
POWER OF INNOVATION

Urban Oilfields from Garbage

SEKISUI CHEMICAL CO., LTD. of Japan is pioneering new frontiers, producing ethanol from garbage through a fermentation process

The pilot plant built in a cooperative effort with a disposal treatment facility in Saitama is drawing interest from countries and businesses around the world.



Ethanol generated from combustible garbage with support from LanzaTech, USA offers potential as another income stream for governments.

The Dec. 6, 2017 press release read "…breakthrough in the conversion of Municipal Solid Waste to ethanol." SEKISUI CHEMICAL CO., LTD. is converting Municipal Solid Waste (MSW) marked for landfill or incineration into new products that otherwise would have come from fossil resources. As the world faces depleted fossil resources and a mounting waste problem, this technology offers new hope for a cleaner, healthier planet.

"We asked ourselves if we could convert trash into a natural resource and began looking into possibilities about ten years ago," says Satoshi Koma, SEKISUI CHEMICAL BR Project General Manager at the Corporate R&D Center.

Postwar Japan's accelerated growth led to large-scale production and consumerism, resulting in unprecedented amounts of garbage, which opened the world's eyes to the consequences of waste on health, safety, and the environment—including dioxin emissions and soil pollution. The World Bank estimates that the planet is currently managing 1.3 billion tons of garbage a year, and that figure is expected to grow to 2.2 billion by 2025.[1]

SEKISUI CHEMICAL started operations in 1947 as a general plastics producer, and soon the company was tackling Japan's water supply and sewage issues with vinyl chloride piping, which is corrosion resistant, light, and easy to assemble. However, the footprint that plastic manufacturing leaves on the environment, particularly concerning CO_2 emissions and resource depletion, has caused the industry to reevaluate its approach.

SEKISUI CHEMICAL estimates that Japan produces about 60 million tons of burnable trash a year, based on a Ministry of the Environment report.[2] When converted into calories, this amounts to 200 trillion kilocalories. Fossil resources used in plastic production amount to 150 trillion kilocalories a year, so this is where Koma and his team decided to shift their attention.

The technology for converting burnable trash into gas is well established in Japan, but this waste includes a mix of organics, plastics, and paper products that make the components unstable, inconsistent, and full of impurities. With typical catalysts, recycling these fossil resources has been extremely difficult, but Koma and his team discovered that microorganisms are likely candidates for replacement catalysts due to their compatibility with Japan's burnable garbage.

This led them to partner with American biotech leader LanzaTech, whose extensive expertise in microbe-based carbon conversion enabled Koma's project to advance rapidly.

"The microbes we're working with have existed on earth since time immemorial, and this is a safe technology," Koma assures us. "These microbes produce ethanol through the same fermentation process we use to make drinking alcohol."

On occasion, the volatile gasses released by the process would slow fermentation or even kill the bacteria off. This problem inspired SEKISUI CHEMICAL to develop a system for removing impurities from the gas, providing an ideal environment for the working microbes. In 2014, pilot plant operations commenced at the Saitama disposal treatment facility managed by ORIX Environmental Resources Management Corporation.

"There are 1,200 garbage incinerators in Japan," SEKISUI CHEMICAL's BR Promotion Group Section Chief Shinichi Tsukagawa tells us, "Once we have these recycling plants operating alongside waste disposal facilities and incinerators, we'll be able to realize our vision of producing raw materials locally using local waste as feedstock."

This new technology is efficient and more profitable than conventional technology, and since the 2017 press release, governments and businesses around the world have inquired about the system. Also, several European and Asian countries have expressed interest in building their own plants. SEKISUI CHEMICAL is bringing a new vision of total resource recycling to the world as operations at the first plant commence in 2019. ✻

Left: Satoshi Koma joined SEKISUI CHEMICAL in 1995, where he took charge of ethanol production from the Waste Technology Development Project. He is currently General Manager of BR Project, Corporate R&D Center.

Right: Shinichi Tsukagawa joined SEKISUI CHEMICAL in 1997. After working in SEKISUI's Residential Division, he moved to the BR Promotional Group where he is currently Manager of BR Project, Corporate R&D Center.

[1] The World Bank, "Solid Waste Management" (March 27, 2018).
[2] Ministry of Environment, "Report on the Investigation into the Actual Recycling of Waste Materials and Transport of Waste Materials over Wide Areas" (2016)