

Initiatives for chemical recycling that support the recycling of plastic resources



November 16, 2021
Showa Denko K. K.
Kawasaki Office
KPR Promotion Office
Kuriyama

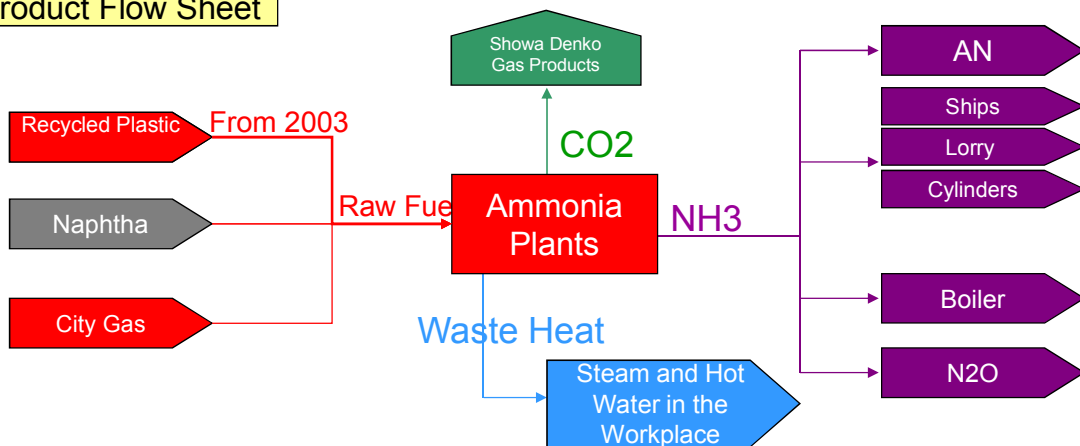


Background of implementation of the plastic and chemical recycling project



Showa Denko's plastic and chemical recycling simultaneously solves the problems of plastic and global warming with a method that removes clean hydrogen from plastic

Raw Material and Product Flow Sheet



Applications



Chemical Fibers



Highly Pure Gas



Denitration



Carbon Fiber

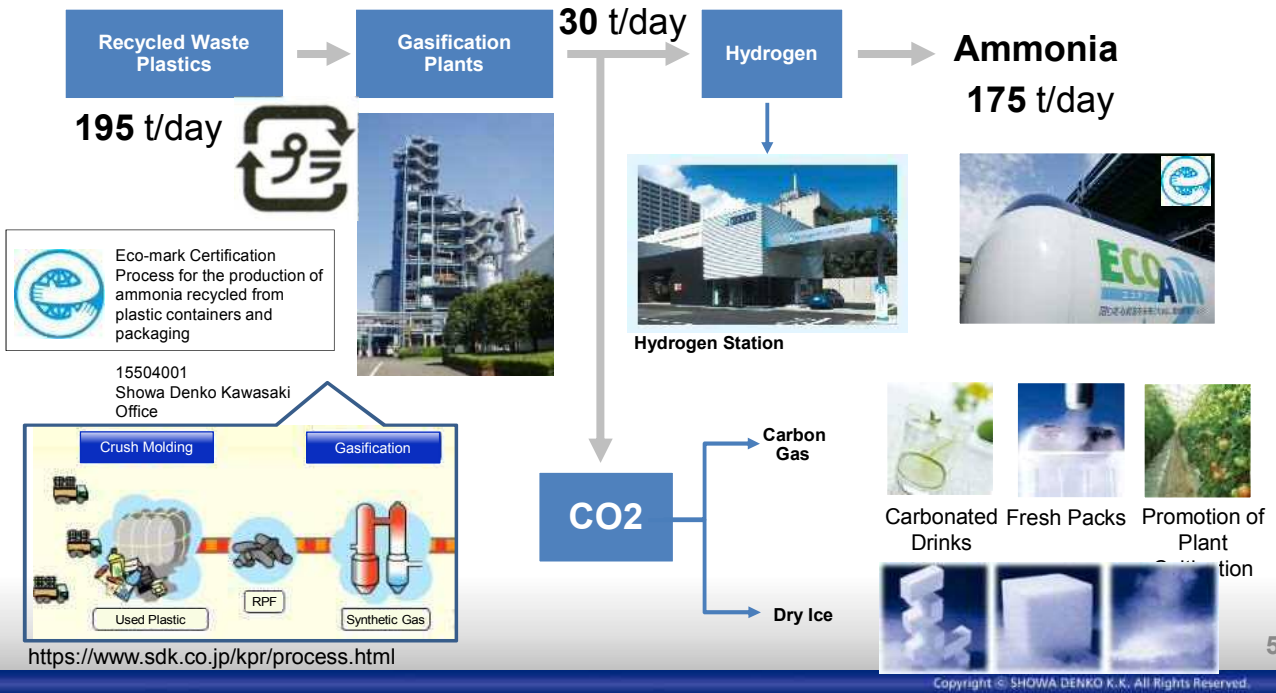


Nitrogen Fertilizer

Showa Denko Waste Plastic and Chemical Recycling Projects



- Productization of low-carbon hydrocarbons, ammonia, and CO2 through recycling plastics
- Loading approximately 200 t of plastic daily; processing approximately 60,000 t of plastic. (Processing approximately 10% of container recycled plastics from households)
- Obtained eco-mark certification as a manufacturing process for the first time in Japan.



Overview of Crush Molding Equipment



昭和電工株式会社



Compressed Bales (Acceptance)



Volume Reduced Molded Product (RPF)



Crushing (Crusher)

(Magnetic
Sorter)

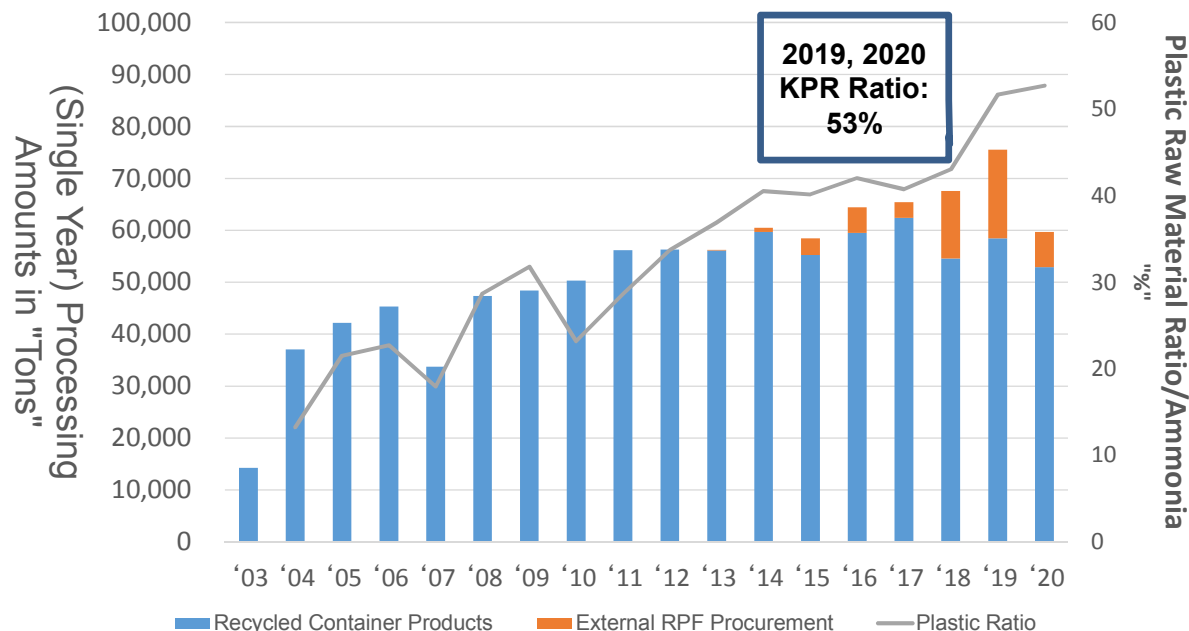


Volume Reduced Mold (Molding Machine)

Showa Denko's waste plastics processing record



- Stable production has continued for 17 years since 2003; approximately 900,000 tons of plastic has been recycled to date.
- The ammonia raw material ratio has reached 50% thanks to improvement of equipment and operation technology.
- Economically established thanks to subsidies from the Ministry of Economy, Trade and Industry during the initial construction and continued recycled plastic containers (variable assistance)



Overview of Gasification Equipment



昭和電工株式会社



Gasification Equipment



Low-temperature Gasification Furnace

Temperature: 600°C
Pressure: 1 MPaG

High-temperature Gasification Furnace

Temperature: 1400°C or Higher
Pressure: 1 MPaG



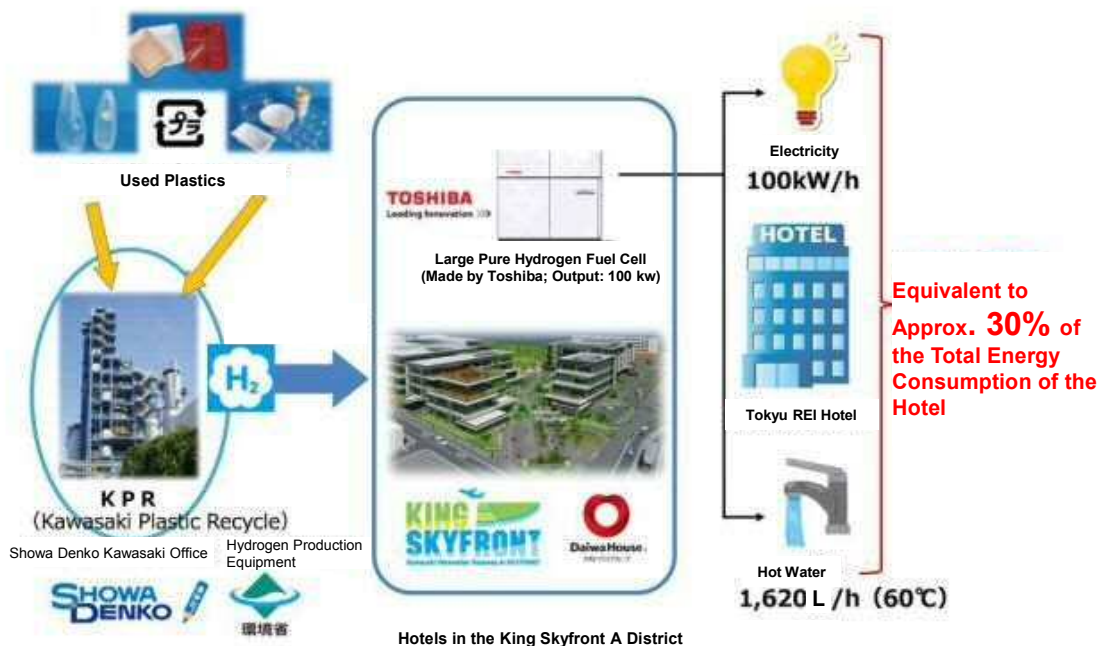
Does not use fossil fuels during normal operation

Low-carbon hydrocarbon supply at Shinsuna Hydrogen Station, Koto-ku, Tokyo, July 2017
(Basho Chamber of Commerce Facility)



Specification		ISO14687-2
Hydrogen Purity		99.97%
Non-Hydrogen Components	Total Hydrocarbons (C1)	2 ppm
	Moisture (H ₂ O)	5 ppm
	Oxygen (O ₂)	5 ppm
	N ₂ , Ar	100 ppm
	He	300 ppm
	Carbon Dioxide (CO ₂)	2 ppm
	Carbon Monoxide (CO)	0.2 ppm
	Sulfur Compounds	0.004 ppm
	Formaldehyde	0.01 ppm
	Formic Acid	0.2 ppm
	Ammonia	0.1 ppm
	Total Halides	0.05 ppm

Conclusion of a Comprehensive Agreement Toward Implementation of Hydrogen Society with Kawasaki City
Planning to use plastic-derived hydrogen at hotels that began operations in 2018.



Why are hotels making lettuce?

Kawasaki King Skyfront Tokyu Rei Hotel is the world's first hydrogen hotel. Showa Denko Co., Ltd. produces electricity and hot water with low-carbon hydrocarbons derived from used plastics brought from the Kawasaki office, which is utilized for approximately 30% of the electricity in the entire hotel.



1 Recycle plastic to produce low-carbon hydrocarbons (Showa Denko)

Lettuce cultivation is a demonstration test to attain a low-carbon society (CO2 reduction) by utilizing power derived from low-carbon hydrocarbons not only for hotel electricity but also for plant growth.

* Ministry of the Environment regional cooperation and low-carbon hydrocarbon demonstration project



5 Hydroponic cultivation of lettuce with hydrogen and electricity



2 Pipelines stably deliver hydrogen in large quantities



3 Conversion of hydrogen to electricity with fuel cells

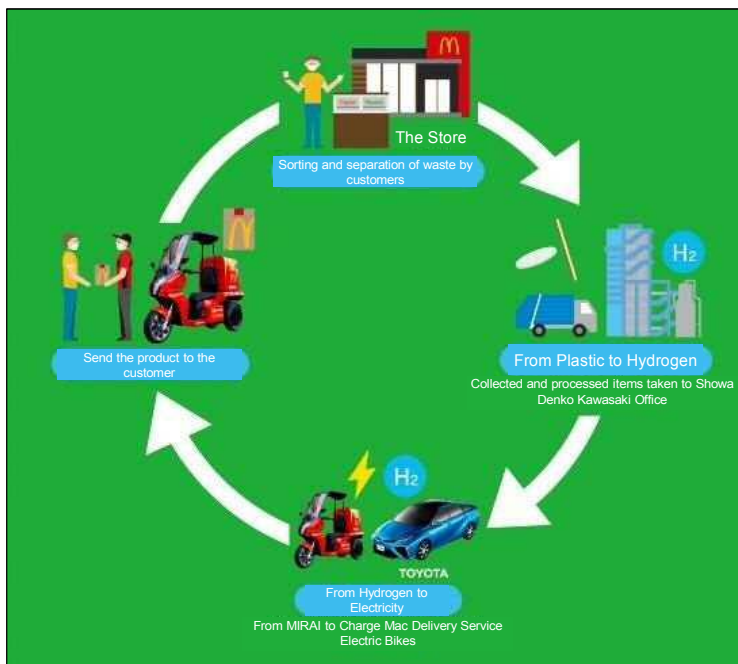


4 Use of electricity in the hotel

Demonstration Project with McDonald's



In December 2020, as a demonstration project to promote the recycling of plastic in Kawasaki City, a demonstration project was implemented to recycle plastic from an inner-city McDonald's store into hydrogen and to reduce it to the electrical power of an electric motor cycles for couriers.



Overview of Demonstration Test with JR East Japan Railway



As a part of our cooperation in the demonstration test of a new vehicle using hydrogen for the East Japan Railway (JR East), on June 3, 2019, three companies, JR East Japan, Japan Freight Railway Company (JR Freight), and Showa Denko, signed a basic agreement for the demonstration test.

(Showa Denko plans to provide plastic-derived low-carbon hydrocarbons in the Ogimachi area.)

March, 2022: Scheduled to start the test

