

February 16, 2023

Progress in Verification Testing of a Used Disposable Diaper Carbonization Recycling System in Japan

Since January 2021, Kao Corporation and Kyoto University have been conducting verification testing of a Used Disposable Diaper Carbonization Recycling System in cooperation with Saito City, Ehime Prefecture in Japan. Technology for converting used diapers into carbon material is expected to be established in 2023, with the goal of beginning public implementation in or after 2025. This is a report on current progress with the project.

Summary of Verification Testing

More than two million tons of used disposable diapers are discarded as trash each year in Japan, most of which is incinerated, and are said to comprise between 4–6% of burnable trash. The diapers have also absorbed a large amount of moisture, which in some cases can degrade incinerator combustion efficiency. Going forward, as the use of disposable diapers for adults increases with the aging of the population, the volume of waste is expected to increase and have an even greater impact on the environment. Establishment of an effective recycling technology is thus anticipated.

Objectives

The project aims to achieve the following three objectives, thus contributing to reducing environmental impact*¹ by reducing CO₂ emissions.

1. Development of carbonization equipment for used disposable diapers

- Efficient carbonization from relatively low energy inputs (through low-temperature reactions)
- Carbonization sterilizes and deodorizes, which will solve any hygiene problems
- Carbonization can reduce weight and volume, which can also reduce collection frequency

2. Conversion of carbonized used disposable diapers to carbon material

3. Public implementation of a recycling system

*1 When used disposable diapers are incinerated, they generate CO₂ emissions. However, when carbonization is performed, the carbon is fixed in carbon material, making it possible to reduce the amount of CO₂ emitted, thereby reducing negative environmental impact.

Targets

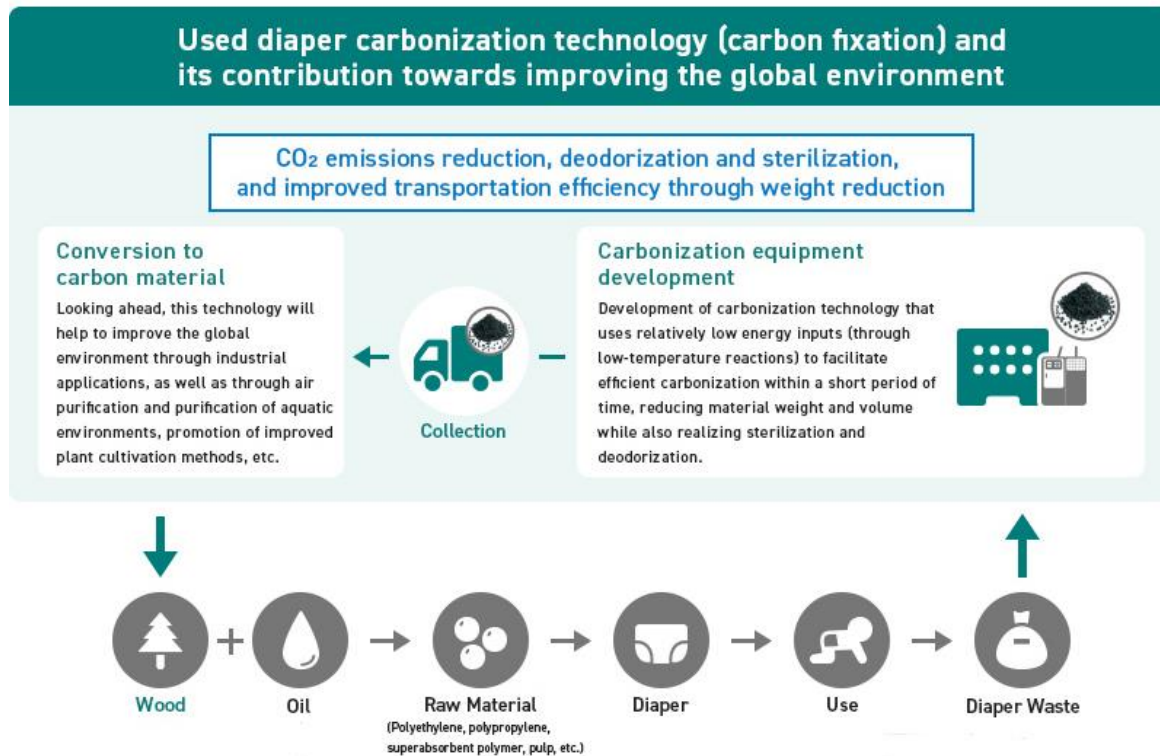
- Establishment of technology for converting used disposable diapers to carbon material by 2023
- Public implementation of the recycling system in or after 2025

News Release from March 2022

[Progress in Kao and Kyoto University's Verification Testing of a Used Disposable Diaper Carbonization Recycling System](#)

News Release from January 2021

[Kao and Kyoto University Begin Verification Testing of a Used Disposable Diaper Carbonization Recycling System in Saijo City, Ehime Prefecture, Japan](#)



Progress and Developments Going Forward

1. Development of carbonization equipment for used disposable diapers

- In November 2021, the carbonization equipment developed by Kao was installed at a childcare facility in Saijo City and began operating in December. Kao is collecting data on the processing of used diapers and is considering ways of improving the system's performance.
- Kao and Kyoto University are advancing development of carbonization technology through thermal decomposition of pulp based on used disposable diapers, and have verified a method of increasing carbon yield to develop pores (microscopic holes). They have discovered the possibility of efficiently converting discarded pulp into activated carbon, which will broaden potential applications, including, for example, use as an absorbent. Kyoto University presented these results in a paper at the Society of Chemical Engineers, Japan, 53rd Autumn Meeting held in September 2022.
- The carbonization equipment made it possible to reduce the weight and volume of the used disposable diapers by about 95%. Going forward, Kao and Kyoto University will advance development of a second machine, with the goal of operating it with even lower energy consumption while reducing processing times.

2. Conversion of carbonized used disposable diapers to carbon material

- Using samples of high-quality semi-carbonized materials^{*2} now obtainable from the carbonization equipment, Kao and Kyoto university are now advancing research aimed at converting them into carbon materials such as tire fillers, electronic materials and other advanced recycling materials, as well as activated carbon that can be used in water retention and soil conditioning agents, for plant growth and in sewage treatment.
- Since April 2020, Kao, together with chemical manufacturer Sanyo Chemical Industries, Ltd. and Tottori University, has engaged in research and development aimed at recycling the super-absorbent polymer (SAP) used in disposable diapers. At the September 2022 conference of the Japanese Society of Soil Science and Plant Nutrition, Tottori University presented a paper regarding the applicability of used disposable diapers for soil amendment.

*2 To make a substance with a high carbon content through thermal decomposition (torrefaction)

3. Public Implementation of a Recycling System

A review of infrastructure, including sites for installation of carbonization equipment and collection methods, is continuing.

In April 2019, the Kao Group established the Kirei Lifestyle Plan, an ESG strategy. Since its start in 2021, the Kao Group Mid-term Plan 2025 (K25) has proclaimed “protecting future lives” and promoting “sustainability as the only path” as its vision. The current initiative addresses one of the Kirei Lifestyle Plan’s leadership actions, to contribute to “zero waste” and “decarbonization.” The Kao Group will continue to integrate its ESG strategy into its management practices. It will also develop its business, provide better products and services for consumers and society, and work toward its purpose, “to realize a Kirei world in which all life lives in harmony.”

About the Kirei Lifestyle Plan

Over the past 130 years, Kao has worked to improve people’s lives and help them realize more sustainable lifestyles—a Kirei Lifestyle. The Japanese word ‘kirei’ describes something that is clean, well-ordered and beautiful, all at the same time. The Kao Group established its ESG strategy, the Kirei Lifestyle Plan in April 2019, which is designed to deliver the vision of a gentler and more sustainable way of living. By 2030, Kao aims to empower at least 1 billion people, to enjoy more beautiful lives and have 100% of its products leave a full lifecycle environmental footprint that science says our natural world can safely absorb. For more information please, click [here](#).

About Kao

Kao creates high-value-added products and services that provide care and enrichment for the life of all people and the planet. Through its portfolio of over 20 leading brands such as *Attack*, *Bioré*, *Goldwell*, *Jergens*, *John Frieda*, *Kanebo*, *Laurier*, *Merries*, and *Molton Brown*, Kao is part of the everyday lives of people in Asia, Oceania, North America, and Europe. Combined with its chemical

business, which contributes to a wide range of industries, Kao generates about 1,420 billion yen in annual sales. Kao employs about 33,500 people worldwide and has 135 years of history in innovation. Please visit [the Kao Group website](#) for updated information.

Media inquiries should be directed to:

Public Relations

Kao Corporation

Tel.: +81-3-3660-7043

Related Information

- [Kao launches new ESG Strategy “Kirei Lifestyle Plan” to support consumer lifestyle changes](#)
- [Kao’s New Challenges for the Future: Accelerating Purposeful Business Commitment with ESG](#)
- [Kao sustainability website](#)