

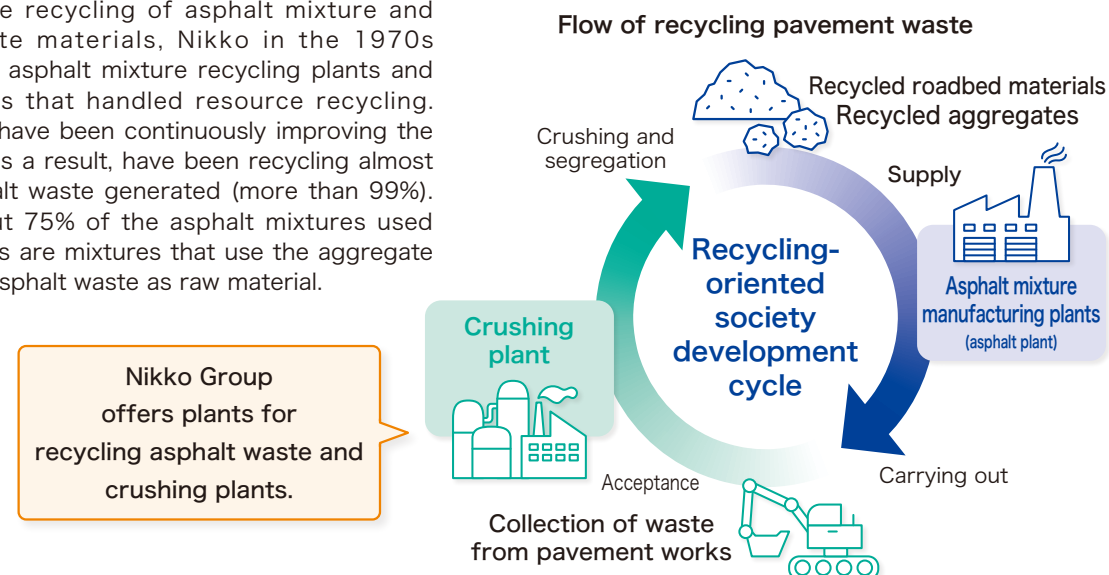
Establishment of recycling-oriented society

Since the 1970s, the Nikko Group has been pursuing the development of plants capable of recycling construction and road waste materials for reducing the environmental burden, thus contributing towards improving resource

productivity and establishing a recycling-oriented society. We have been proactively implementing various initiatives such as recycling of plaster boards and concrete sludge towards minimizing industrial waste.

1 Recycling of asphalt waste (more than 99% is recycled)

To advance the recycling of asphalt mixture and concrete waste materials, Nikko in the 1970s commercialized asphalt mixture recycling plants and crushing plants that handled resource recycling. Since then, we have been continuously improving the products, and as a result, have been recycling almost all of the asphalt waste generated (more than 99%). Currently, about 75% of the asphalt mixtures used for paving roads are mixtures that use the aggregate recycled from asphalt waste as raw material.



2 Recycling of plasterboards

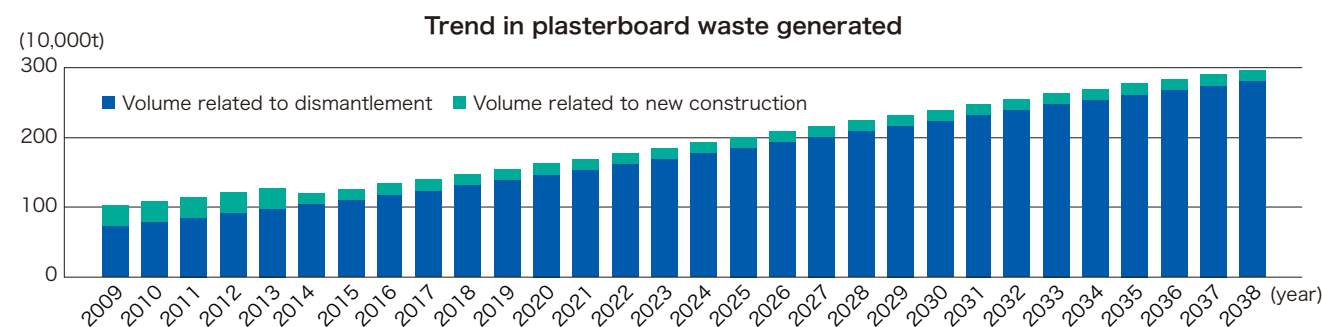
Plasterboards, which are used for walls and ceilings of a building's interior, are composite materials made of plaster molded into a board shape set between two sheets of paper. They have been used widely because they are cheap, easy to install, and superior in fire resistance and sound insulation. However, if they are disposed of directly into soil, their main raw material of calcium sulfate and other organic contents will be decomposed by microorganisms and may generate hydrogen sulfide, a substance harmful to humans. For this reason, plasterboards are required by law to be disposed as industrial waste at a controlled final disposal site.

With housing built during the high economic growth era beginning to be demolished, the plasterboard waste volume is estimated to reach 2 million tons in Japan in 2025, and

exceed 3 million tons in 2039*. At the same time, the cost of disposal has been soaring especially in urban areas as there is only limited space available at controlled final disposal sites.

*Estimate by Gypsum Board Association of Japan
Nikko developed and introduced a recycling plant that enables recycling of plasterboards as solidification agent used as soil improver at construction sites by applying its proprietary heating, mixing and kneading, and drying and other plant-related technologies. It contributes to a recycle-oriented economy by simultaneously achieving disposal of plasterboards and manufacture of solidifying agent.

See "Development of Manufacturing System for Hemihydrate Gypsum and Type II Anhydrous Gypsum," an academic paper by Nikko engineers, for details. https://www.nikko-net.co.jp/product/pdf/technical-report-2020_06.pdf



Prepared by Nikko based on the FY2013 Investigative Report for Discussion of Measures to Promote Recycling of Plasterboard Waste by Ministry of the Environment

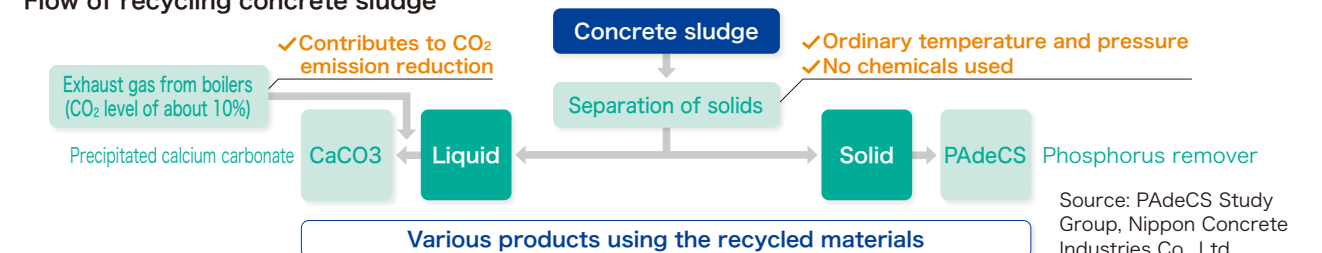
3 Recycling of cement sludge

Cement sludge comes from residual concrete and returned concrete generated during the manufacture of ready-mixed concrete and secondary concrete products. Cement sludge requires specific processes, such as dewatering and drying, before being disposed of as industrial waste. Japan produces about 3.5 million tons of cement sludge every year, and the disposal cost is 5,000 yen to 10,000 yen per ton.

When cement sludge is separated into liquid and solid, precipitated calcium carbonate (CaCO₃) is extracted from the liquid and phosphorus remover (PAdeCS) is extracted from the solid portion. Various products use precipitated calcium carbonate as a raw

material: pharmaceuticals, paper, cosmetics, ferrite, condensers, optical glass, coatings, rubber, and plastics. Phosphorus remover is also expected to have many applications: rock phosphate substitute, neutralizer, night soil treatment agent, deodorizer, antiseptic, heavy metal remover, and water-bloom suppressant. Precipitated calcium carbonate absorbs CO₂ in the refining process that could reduce CO₂. Nikko will contribute to technology development for recycling cement sludge and its practical applications by closely working with the ready-mixed concrete, secondary concrete products, and cement industries.

Flow of recycling concrete sludge

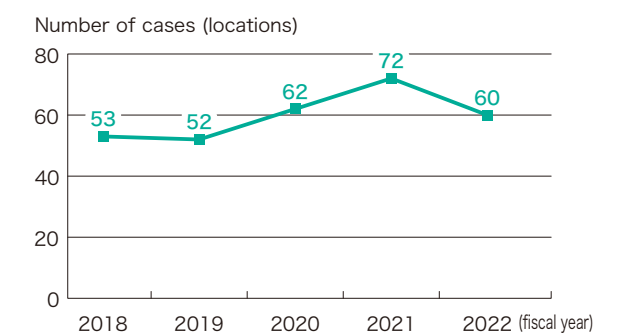


Source: PAdeCS Study Group, Nippon Concrete Industries Co., Ltd.

Early restoration from intensifying disasters

To recover from intensifying natural disasters such as large typhoons, severe rainstorms, and earthquakes, we start with a quick recovery work of the Group's damaged plants. In recent years, it has rained a lot unexpectedly around the country, frequently causing torrential damages. Natural disasters, including large-scale typhoons and frequent occurrence of linear precipitation zone, large earthquakes such as the Nankai Trough and Tokyo Metropolitan near-field earthquakes, and the resultant tsunamis and volcanic eruptions, are anticipated. The disaster risks facing Japan area moving into a new stage. As the top manufacturer of asphalt and concrete plants, Nikko Group focuses on ensuring early recovery from disasters by closely collaborating with customers so as to fulfill its supply responsibility.

Trend in natural disaster damage to Nikko plants



Co-existence with local communities

Our Head Office is located in Akashi City, Hyogo Prefecture—the place our factory was located when the company was established. The Nikko Business Foundation has been offering scholarships that do not require repayment since 1989 to domestic and overseas students enrolled in universities and institutes of technology offering a five-year program specializing in technology/engineering in Hyogo Prefecture and to students from Hyogo Prefecture studying in the Kinki region.

It is also offering research grants to those who are engaged

in academic research related to technology development at universities and technology/engineering institutes in the Kinki region. The recipients of these grants are not obligated in any way to join the Nikko Group or to provide the results of their research to the Group. It incorporates the strong feeling of the Nikko Group "to contribute to the development of the local economy and communities by providing assistance for human resource development and technological innovations."

Number of scholarships and grants offered so far (cumulative from FY 1989 to FY 2022)

Number of scholarships awarded: 141
Number of research grants awarded: 197

New scholarships and research grants awarded in FY 2022

Number of scholarships awarded: Two

• Osaka Metropolitan University
• University of Hyogo

Number of research grants awarded: Two

• Kobe City College of Technology (Research theme: development of resistance fusion bonding process of carbon fiber-reinforced thermoplastic using carbon nanotube-added resistive heating element and evaluation of bonding strength)
• University of Hyogo (Research theme: development of plastic that dissolves in ocean)