Column

Why are CE and CN important to the Taiheiyo Cement Group?

Circular Economies and Taiheiyo Cement's Initiatives

A circular economy (CE) is an economic system that circulates resources by reusing waste, aiming for the sustainable use of resources and environmental protection. Leveraging the characteristics of the cement manufacturing process, our company utilizes various waste and by-products as raw materials and fuel.

This is possible because the main chemical components of cement are CaO (calcium), SiO_2 (silica), Al_2O_3 (alumina), and Fe_2O_3 (iron), and cement can still be produced even when the conventionally used raw materials are replaced by various wastes containing these components. Taking advantage of these characteristics of cement, we use many wastes and by-products in cement production, including for fuel substitution, thereby contributing to the realization of CE through the effective utilization of resources and the extension of the lifespan of final disposal sites.

In March 2025, we held a "Sustainability Briefing" and explained our CN and CE initiatives to investors and financial professionals.

Amount and Intensity of Main Waste and By-products Used (FY2025)

Non-consolidated

Waste and By-products	Amount used (t)	Basic unit (kg/t-cement)
Coal ash	1,779,387	135.1
Blast furnace slag	969,035	73.6
By-product gypsum	453,980	34.5
Unburned ash, dust	378,187	28.7
Dirt and sludge	378,187	28.7
Construction soil	146,528	11.1
Waste oil	178,159	13.5
Wood chips	12,705	1.0
Waste plastic	232,558	17.7
Water treatment plant sewage sludge and ash	306,995	23.3
Municipal waste incineration ash	137,123	10.4
Municipal waste	14,074	1.1
Other	449,836	34.0
Total	5,436,755	412.6
Raw material-related waste	5,013,333	380.5
Fuel-related waste	423,422	32.1
Total	5,436,755	412.6

Relationship between the components of cement and its raw materials

Main chemical components of cement (required components)		Main raw materials	Substitutes (examples)
Calcium oxide (CaO)	63~65%	Limestone (CaO source)	Ready-mixed concrete sludge
Silicon dioxide (SiO_2)	20~23%	Clay (SiO_2, Al_2O_3 source)	Coal ash, slag, incineration ash, construction soil, sludge
Aluminum oxide (Al_2O_3)	4~6%	Silica (SiO_2 source)	Molding sand, waste glass
Iron oxide (Fe_2O_3)	2~4%	Iron oxide (Fe_2O_3 source)	Blast furnace dust, non-ferrous slag

Cement Manufacturing, CE, and CN

The cement manufacturing process is divided into three stages, as shown from the left in the diagram below: the raw material preparation process, the burning process, and the finishing process.

In the first “raw material preparation process”, waste and by-products are ground in appropriate proportions along with natural raw materials such as limestone and silica stone to create the prepared raw materials. In the central "Burning Process", the prepared raw materials pass through a preheater and are then burned in the rotary kiln. As the temperature rises, the raw materials undergo chemical changes and transform into clinker minerals such as alite (C_3S) and belite (C_2S). Also, during this burning process, raw material-derived CO_2 is emitted due to the decarbonation of limestone. Since fossil energy is used to maintain these high temperatures, energy-derived CO_2 is also generated. The generation of CO_2 in this burning process is unavoidable for the cement industry due to the nature of the manufacturing process, and reducing it as much as possible, or capturing it for utilization and storage, is an important challenge for our group's carbon neutrality strategy.

In the final “finishing process”, the product, Portland cement, is manufactured by grinding the clinker obtained in the “burning process” while adding a small amount of gypsum ($CaSO_4 \cdot 2H_2O$).