

# Utilization of Waste and By-products in Cement Manufacturing

**Cement can utilize various types of waste and by-products as raw materials and fuel by taking advantage of the characteristics of its manufacturing process.**

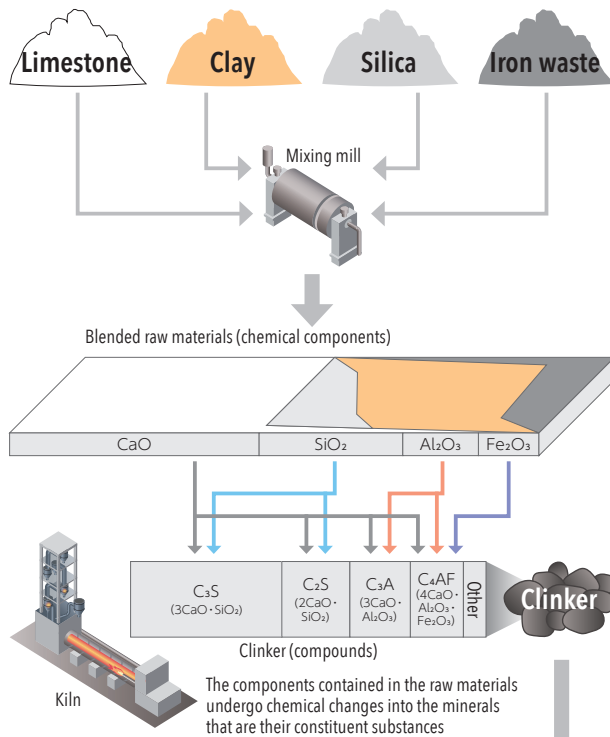


Original Character  
Dr. Cemenstein

One of the reasons is the manufacturing process of clinker, an intermediate product. Most of the clay and iron waste used for clinker production are currently waste and by-products, and by blending these with natural raw materials such as limestone and silica stone in appropriate proportions and grinding them in a raw material mill, blended raw materials are produced. Cement manufacturing technology blends raw materials with various compositions to achieve a certain quality.

Clinker is produced by a chemical reaction when this blended raw material is fired in a kiln, and waste such as waste plastic is used as an energy source as fuel. Clinker is then ground with gypsum (mainly a by-product) to become Portland cement. Blast furnace slag and other supplementary cementitious materials are added to cement to make blended cement, taking advantage of their pozzolanic properties of hardening when stimulated by cement.

## Production of clinker

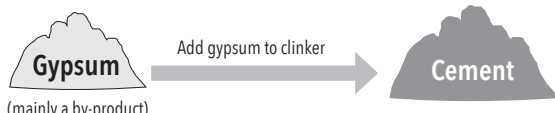


## Amount and intensity of main waste and by-products used

Non-consolidated

Waste and By-products	Amount used (t)	Intensity (kg/t-cement)
Coal ash	1,686,689	129.9
Blast furnace slag	947,365	73.0
By-product gypsum	456,459	35.2
Unburned ash, dust	429,905	33.1
Dirt and sludge	359,497	27.7
Construction soil	181,113	14.0
Waste oil	146,704	11.3
Wood chips	20,157	1.6
Waste plastic	222,150	17.1
Water treatment plant sewage sludge and ash	327,527	25.2
Incineration residues from municipal waste	137,055	10.6
Municipal waste	21,707	1.7
Other	540,065	41.6
<b>Total</b>	<b>5,476,393</b>	<b>421.9</b>
Alternative raw material	4,923,390	379.3
Alternative fuel	553,003	42.6
<b>Total</b>	<b>5,476,393</b>	<b>421.9</b>

## Cement production



## Blended cement production

