

Cement Production

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 Climate Mitigation Services
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Taiheiyo Cement

www.taiheiyo-cement.co.jp/english/ Tokyo

yellow column indicates original reported units

Founded in 1881

Cement production & emissions data



Year	Cement Prod		Energy Use		CO2 emissions	
	Clinker ratio	Annual production	Gross consumption	Gross consumption	Emissions rate	Net emissions
	Million tons/yr	Million tonnes/yr	Billion Btu	Terajoules	kg CO2/tonne	Million tonnes/yr

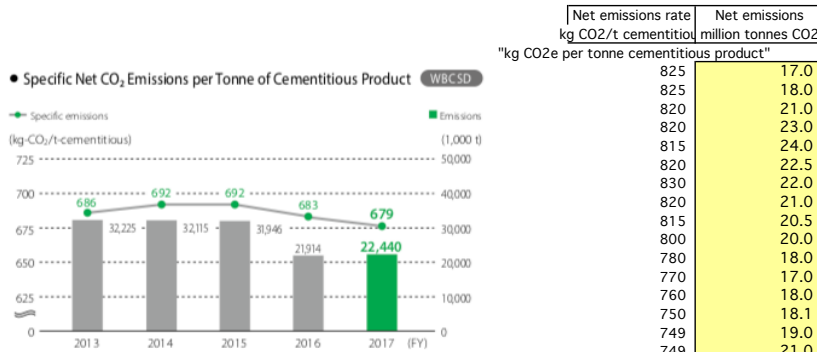
TAIHEIYO CEMENT CORPORATION

Key Performance Indicators of the CSI and GCCA for Fiscal 2018*1

CO ₂ and Climate Protection (CO ₂ emissions, energy consumption)		FY2016	FY2017	FY2018
Number of facilities using CSI and GCCA*The Cement CO ₂ and Energy Protocol* guidelines for emissions inventory		18	18	18
Percentage of facilities using CSI and GCCA*The Cement CO ₂ and Energy Protocol* guidelines for emissions inventory (%)		100	100	100
Total CO ₂ emissions (million tonnes/year)	Gross	22.7	23.3	23.5
	Net ²⁾	21.9	22.4	22.6
CO ₂ emissions per tonne of cementitious product*1 (kg-CO ₂ /t-cementitious)	Specific gross CO ₂ emissions	708	703	695
	Specific net CO ₂ emissions	683	679	671
Emissions from electricity purchased (million tonnes/year)		0.886	0.985	0.963
Specific heat consumption of clinker production (MJ/t clinker)		3,306	3,303	3,288
Alternative fuel rate (% of thermal energy consumption) of kiln		11.3	11.6	12.0
Biomass fuel rate (% of thermal energy consumption) of kiln		1.8	1.8	1.8
Clinker/cement ratio (%)		83.1	82.9	82.8

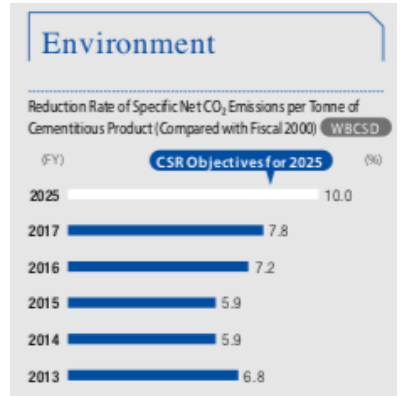
Alternative Raw Materials Use		FY2016	FY2017	FY2018
Alternative raw materials rate: consumption of alternative raw materials, as a percentage of total raw materials for cement and clinker production (%; calculated on a dry basis)		15.5	15.5	16.0

Taiheiyo Cement Corporation (2019) Corporate Social Responsibility Report 2018, page 70.



Taiheiyo Cement (2018) Corporate Social Responsibility Rpt, p. 49

Net emissions rate kg CO ₂ /t cementitious product	Net emissions million tonnes CO ₂
825	17.0
825	18.0
820	21.0
820	23.0
815	24.0
820	22.5
830	22.0
820	21.0
815	20.5
800	20.0
780	18.0
770	17.0
760	18.0
750	18.1
749	19.0
749	21.0
760	20.5
765	22.0
770	22.0
760	22.5
765	23.0
790	24.0
780	22.0
770	20.1
760	18.1
760	18.1
760	18.0
760	17.5
760	16.9



Emissions / Product	Annual production		Energy input MJ/tonne clinker	domestic sales Million tons
	Tonnes CO ₂ /tonne	million tonnes		
0.642	24.4	3,302		
0.783	19.1	3,231	55.5	
0.833	17.3	3,282	50.9	
	14.8	3,287	42.7	
	14.1	3,321	41.6	
	14.6	3,316	42.7	
	15.4	3,286	44.6	
		3,305		
		3,288		
		3,306		
		3,306		
		3,268		

Conflicting data million tonnes CO ₂	
37.41	
37.51	
34.61	
32.70	

Taiheiyo SustRpt 2017, page 64.

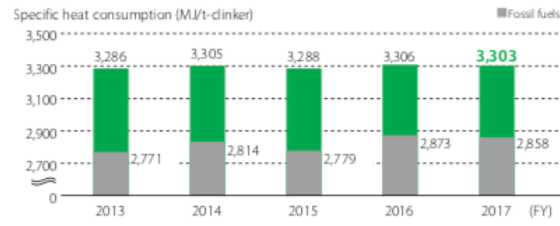
Taiheiyo SustRpt 2018, page 68.

Taiheiyo SustRpt 2019, page 70.

Total						862
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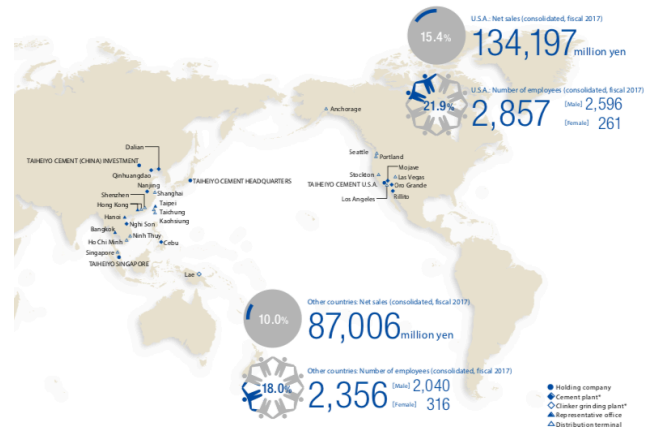
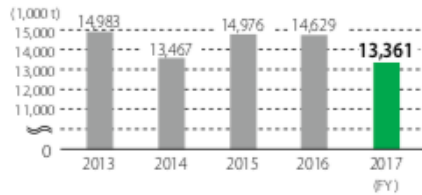
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• Specific Heat Consumption of Clinker Production WBCSD



CO ₂ Emissions	
CO ₂ * (1,000 t)	13,361
From purchased electricity (1,000 t)	196

* Does not include CO₂ from transportation, which is calculated separately (see page 39)



Taiheiyō CSR Rpt 2018, page 49.

INPUT								
Energy		Raw Materials		Other Materials		Water		
Coal (t)	2,314,022	Natural Resources	Limestone (t)	37,158,919	Additives, etc. (t)	8,970	Water total (1,000 m ³)	169,061
Petroleum coke (t)	319,365		Clay (t)	8,197	Explosives (t)	3,867	Tap water (1,000 m ³)	1,120
Heavy oil (kl)	20,021		Silica (t)	1,651,213	Refractory material (t)	14,516	Industrial water (1,000 m ³)	3,386
Diesel oil (kl)	18,445		Gypsum (t)	84,713	Grinding media/Steel casing (t)	1,309	River water (1,000 m ³)	5,265
Kerosene, other (kl)	16,471		Other (t)	6,816			Ground water (1,000 m ³)	10,698
Recycled fuels (t)	679,705	Waste/by-products	Iron wastes (t)	206,842	Lubricants/Chemicals (kl)	5,063	Rainwater (1,000 m ³)	386
Purchased electricity (MWh)	564,488		By-product gypsum (t)	492,114	Other (t)	34,873	Seawater (1,000 m ³)	148,205
			Fly/Coal ash (t)	2,200,298				
			Blast furnace slag (t)	904,354				
		Other (t)	2,011,602					

Taiheiyō Cement CSR Rpt 2018, page 48.

Cell: H9**Comment:** Rick Heede:

"Chichibu Onoda Cement Corp. merged with Nihon Cement Co. to form Taiheiyo Cement Corporationent Co. to form Taiheiyo Cement Corporation." Taiheiyo CSR 2008.

Cell: K11**Comment:** Rick Heede:

Emissions from cement fabrication are of two main types: Calcining process of calcium carbonate into clinker liberates carbon dioxide, and emissions from the energy used in the manufacturing process. Typically not included in the emissions estimates are transportation energy, the burning of wastes, or plant construction.

Cell: E12**Comment:** Rick Heede:

The industry calcination factor ranges from 525 to 900 kg CO2 per tonne of clinker (net), but of course varies from company to company, and will tend to decrease over time as process efficiencies improve.

WBCSD (2002) "Toward a Sustainable Cement Industry: Key Performance Indicators," by Joseph Fiksel, Battelle, for WBCSD. "Each tonne of Ordinary Portland Cement generates ~900 kg of net CO2 emissions ... and consumes roughly 3,000 MJ of total electrical and thermal energy," p. 8.

Cell: H12**Comment:** Rick Heede:

Most cement companies will aggregate emissions from energy use with emissions from cement fabrication. This column is provided for companies that provide both data.

Cell: K12**Comment:** Rick Heede:

Average CO2 emissions intensity have declined 16.5 percent from 1990 to 2009 -- from 758 net kg CO2 per tonne of cementitious product in 1990 to 633 kg CO2/t in 2009, according to WBCSD data.** This project estimates process emissions from calcining limestone and thus excludes emissions from fuel and electricity inputs inputs to cement manufacturing. The emission rates and net total company emissions both include process and energy-related emission; a subsequent worksheet (SumCement.xls) estimates process emions of CO2.

** World Business Council for Sustainable Development Cement Sustainability Initiative (2009) Cement Industry Energy and CO2 Performance: 'Getting the Numbers Right', wbcscement.org, 44 pp. See GNR Indicator 326, reproduced at the "Cement industry data" worksheet in this portfolio.

Cell: K42**Comment:** Rick Heede:

Taiheiyo Cement (2004) Annual Report. Estimated from a bar chart; uncertainty +/- 4 percent.

Cell: K71**Comment:** Rick Heede:

CSRpt 2008, page 23 (see column chart above) shows CO2 emissions FY2003-FY2007.

Cell: M74**Comment:** Rick Heede:

CSR 2008, page 17. Taiheiyo company-wide emissions total 37.51 million tonnes CO2 (net) and 38.41 MtCO2 (gross). "Net CO2 emissions: The total CO2 emissions minus the CO2 emissions from alternative fuels." Also (column "J"): 753 net kgCO2 per tonne of cementitious product (772 kgCO2/tonne gross).

Unclear why CO2 emissions in table on page 19 shows 16.506 MtCO2 in FY2005, 16.730 MtCO2 in FY2006, and 15.660 MtCO2 in FY2007.

Again, in table on page 24, "Trends in Net CO2 emissions," neither domestic (17.829 MtCO2) nor overseas (19.681 MtCO2) for FY2007 match the data above. Total (37.509 MtCO2) does equal "company-wide emissions" above.

It is unclear whether this data includes non-cement operations, or whether the smaller data is for calcining operations only (excluding fuel inputs).

CMS cites the lower data sets as a conservatism until unambiguous data is at hand.

Cell: K75**Comment:** Rick Heede:

CSR 2009, page 35. Conflicts with data totaling domestic and overseas emissions, page 36. Both data sets reproduced above.

Cell: E76**Comment:** Rick Heede:

2009AR pdf pg 6

Cell: K76**Comment:** Rick Heede:

Taiheiyo CSR Rpt 2014, page 39. CO emissions, million tonnes, excluding transportaion, data for FY2009-2013. Does not specify net or gross emissions.

Cell: M76**Comment:** Rick Heede:

Taiheiyo CSR Rpt 2009, page 17. "Company-wide emissions (the company also makes ceramics, construction materials, electronics).

Cell: E77**Comment:** Rick Heede:

2010AR pdf pg 7 in text

Cell: J78**Comment:** Rick Heede:

Apparently, WBCSD modified the protocol (shifting from V2.0 to V3.1). In the pverlap dual-reporting year of 2010, V2 was 733 kgCO2/tonne cementitious, whereas V3.1 was 707 kgCO2/tonne cementitious.

Taiheiyo CSR Rpt 2014, page 7.

We report the V3.1 values for 2011-2013.

Cell: G80**Comment:** Rick Heede:

AR 2010 pdf pg 4

Cell: K81**Comment:** Rick Heede:

Taiheiyo Cement Corporation (2018) Corporate Social Responsibility Report 2017, page 64.

There is no explanation for the discontinuity with 2013 net emissions data.

Cell: G84**Comment:** Rick Heede:

Taiheiyo Cement, CRS rpt for 2018, page 48.

Cell: K84**Comment:** Rick Heede:

Taiheiyo Cement, CRS rpt for 2018, page 48. See table above. Shows Total net CO2 emissions, in 2017: 22.4 Mt. FY2015-2017 for "specific net CO2 emissions," in 2017: 679 kg CO2 per tonne cementitious product.

Cell: K85

Comment: Rick Heede:

Taiheiyō Sust Rpt 2019. Key Performance Indicators, p. 70. Indicators table shown below. Gross emissions total 23.5 MtCO₂; net emissions 22.6 MtCO₂. (defined as: "Net CO₂ emissions: gross CO₂ emissions minus the CO₂ emissions from alternative-derived fuels.") Clinker / cement ratio: 82.8%. Emissions from purchased electricity 0.963 MtCO₂. Alternative fuel rate: 12% of thermal energy input.