

# Cement Production

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Climate Mitigation Services

File started: 26 December 2005

Last modified: December 2011

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## HeidelbergCement

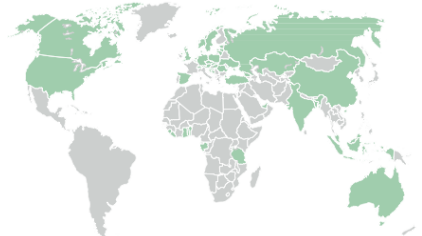
www.heidelbergcement.com Heidelberg

yellow column indicates original reported units

Founded in 1874

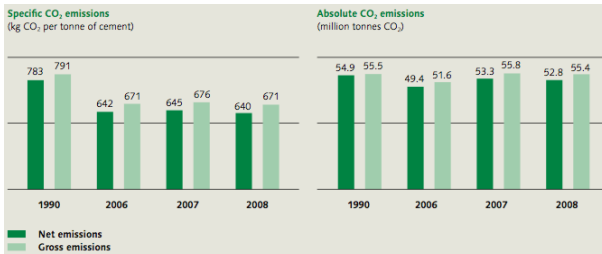
### Cement production & emissions data

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 CO2	Million tonnes/yr CO2



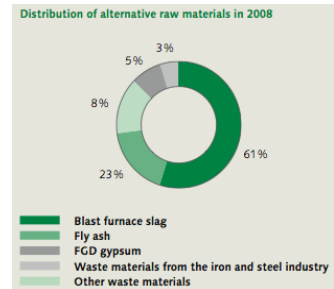
Heidelberg operating regions

## HEIDELBERGCEMENT



HeidelbergCement CSR Rpt 2009, page 38.

Group area	2007	2008
Europe	42.2	43.2
North America	14.9	13.6
Asia-Australia-Africa	30.8	32.2
<b>Total</b>	<b>87.9</b>	<b>89.0</b>



Clinker factor	Cement sales	Thermal mix	Thermal efficiency	Net emissions rate	Net emissions	Gross emissions
% clinker in cement	million tonnes	percent alt fuels	MJ/tonne clinker	kg CO2/t cementitious product	million tonnes CO2	million tonnes CO2

84.3%
81.0%
83.0%
79.0%
75.0%
75.0%
76.1%
76.1%



CSR Rpt 2007, page 21.

51.1	sale	13.2%	
65.2	sale	13.9%	3,600
		9.1%	
		12.0%	
87.9	sales		3,820
89.0	sale	13.5%	3,810
79.3	sale	16.9%	
78.4	sale	16.0%	

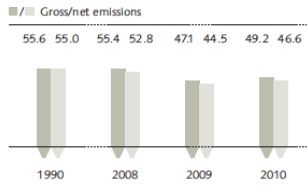
779	54.9	CSR 2008
Interpolated	53.6	
Interpolated	52.3	
Interpolated	51.0	
Interpolated	49.7	
Interpolated	48.4	
Interpolated	47.1	
Interpolated	45.8	
Interpolated	44.5	
Interpolated	43.2	
765	41.9	CSR 2005
Interpolated	39.7	
711	37.4	CSR 2005
696	40.2	CSR 2007
697	42.9	CSR 2007
680	42.0	CSR 2007
667	45.4	CSR 2007
645	53.3	CSR 2009
638	52.8	CSR 2009
629	44.5	CSR 2010
638	46.6	CSR 2010

55.5
41.7
44.7
43.9
47.5
55.8
55.4
47.1
49.2

<b>Total</b>	<b>451</b>	<b>0</b>	<b>11,230</b>	<b>977</b>
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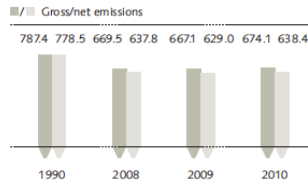
**KEY FIGURES**

**Absolute CO<sub>2</sub> emissions**  
in million t



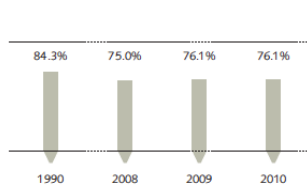
After a fall in CO<sub>2</sub> emission levels between 2008 and 2009, the economic recovery in Europe and economic growth in Asia led to a rise once more in 2010.

**Specific CO<sub>2</sub> emissions**  
in kg CO<sub>2</sub>/t cementitious material



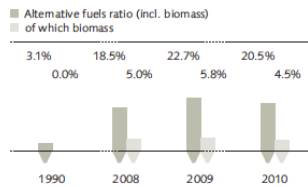
We had been able to constantly reduce specific CO<sub>2</sub> emission levels up until 2009. Their rise in 2010 was a result of the reduced availability of alternative fuels.

**Clinker content in the cement**



The clinker content in the cement remained stable in 2010 against a background of increased clinker and cement production.

**Alternative fuels ratio**



The alternative fuel ratio fell between 2009 and 2010, because we could only use a smaller amount of alternative fuels despite the rise in clinker production.

**Alternative fuels mix in 2010**

Plastics	19.4%	Agricultural waste and waste wood	6.6%
Waste oil	3.3%	Other biomass	5.1%
Tyres	16.1%	Other alternative fuels	33.8%
Solvents	5.3%		
Sewage sludge	3.2%		
Bone meal and animal fat	7.1%		

Considerably less bone meal was available in 2010 than in previous years. We could not entirely compensate for this in 2010 by means of alternative waste flows.

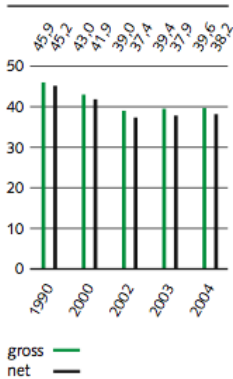
**Emissions of dust, NO<sub>x</sub> and SO<sub>2</sub> in g/t of clinker**

	2008	2009	2010	Progress since 2008
Dust	406	254	265	-35%
SO <sub>2</sub>	509	373	418	-18%
NO <sub>x</sub>	1,422	1,210	1,334	-6%

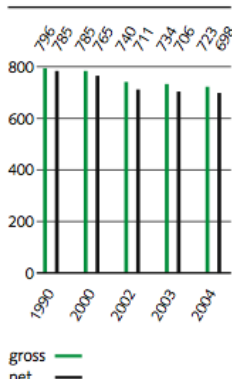
Our investments in environmental protection have been worthwhile. We have been able to reduce dust, and NO<sub>x</sub> and SO<sub>2</sub> emissions considerably since 2008.

Heidelberg CSR Rpt 2010

**Development of absolute CO<sub>2</sub> emissions (Mio t CO<sub>2</sub>)**



**Development of specific CO<sub>2</sub> emissions (kg CO<sub>2</sub>/t cement)**



**Energy and climate protection**

	1990	2008	2009	2010
<b>Cement</b>				
- Absolute gross CO <sub>2</sub> emissions in million t	55.6	55.4	471	<b>49.2</b>
- Absolute net CO <sub>2</sub> emissions in million t	55.0	52.8	44.5	<b>46.6</b>
- Specific gross CO <sub>2</sub> emissions in kg CO <sub>2</sub> /t cementitious material	787.4	669.5	667.1	<b>674.1</b>
- Specific net CO <sub>2</sub> emissions in kg CO <sub>2</sub> /t cementitious material	778.5	637.8	629.0	<b>638.4</b>
- Indirect CO <sub>2</sub> emissions in million t	4.9	5.8	4.1	<b>6.0</b>
- Specific energy consumption in kJ/t cement	4,250	3,516	3,425	<b>3,444</b>
- Absolute energy consumption of cement business line in GJ	300,133	291,119	242,044	<b>251,609</b>

Heidelberg SustRpt 2010, page 44.

**Raw materials and fuels**

	1990	2008	2009	2010
<b>Fuel mix for burning clinker</b>				
- Hard coal	59.6%	55.3%	55.3%	<b>56.7%</b>
- Brown coal	0.0%	5.3%	5.4%	<b>7.6%</b>
- Petroleum coke	2.3%	8.1%	10.1%	<b>8.2%</b>
- Natural gas	22.6%	10.6%	4.8%	<b>4.9%</b>
- Light fuel oil	0.9%	0.4%	0.3%	<b>0.5%</b>
- Heavy fuel oil	8.3%	0.7%	0.7%	<b>0.6%</b>
- Other fossil fuels	3.2%	1.2%	0.7%	<b>0.9%</b>
- Alternative fuels	3.1%	13.5%	16.9%	<b>16.0%</b>
- Biomass	0.0%	5.0%	5.8%	<b>4.5%</b>
- Proportion of biomass in mix of alternative fuels	0.0%	27.1%	25.7%	<b>22.0%</b>
<b>Alternative fuel mix for burning clinker</b>				
- Plastics	0.0%	16.9%	18.7%	<b>19.4%</b>
- Waste oil	39.0%	4.8%	3.5%	<b>3.3%</b>
- Tyres	34.2%	17.1%	14.7%	<b>16.1%</b>
- Solvents	4.7%	5.2%	4.6%	<b>5.3%</b>
- Sewage sludge	0.0%	3.8%	3.3%	<b>3.2%</b>
- Bone meal and animal fat	0.0%	9.0%	9.4%	<b>7.1%</b>
- Agricultural waste and waste wood	0.0%	7.9%	8.2%	<b>6.6%</b>
- Other biomass	0.0%	6.4%	4.7%	<b>5.1%</b>
- Other alternative fuels	22.2%	28.8%	32.9%	<b>33.8%</b>
<b>Clinker content in cement</b>	84.3%	75.0%	76.1%	<b>76.1%</b>
<b>Proportion of alternative raw materials</b>		13.0%	11.3%	<b>11.6%</b>

Heidelberg SustRpt 2010, page 46.

**Cell:** H9

**Comment:** Rick Heede:

"In 1873, Johann Philipp Schifferdecker began building a cement plant in Heidelberg, laying the foundation stone for an international group: Today, HeidelbergCement employs 42,000 people in 1,500 locations in 50 countries. At the end of the 2004 financial year, the total turnover was EUR 6.9 billion."  
CSR Rpt 2005, page 4.

**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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> emissions intensity have declined 16.5 percent from 1990 to 2009 -- from 758 net kg CO<sub>2</sub> per tonne of cementitious product in 1990 to 633 kg CO<sub>2</sub>/t in 2009, according to WBCSD data.\*\* This project estimates process emissions from calcining limestone and thus excludes emissions from fuel and electricity 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 emissions of CO<sub>2</sub>.

\*\* World Business Council for Sustainable Development Cement Sustainability Initiative (2009) Cement Industry Energy and CO<sub>2</sub> Performance: 'Getting the Numbers Right', wbcscement.org, 44 pp. See GNR Indicator 326, reproduced at the "Cement industry data" worksheet in this portfolio.

**Cell:** K57

**Comment:** Rick Heede:

HeidelbergCement, 2009 Sustainability Report, p. 38: data for 1990, 2006-2008 in total CO<sub>2</sub> (net and gross: we report net emissions here), and net kg CO<sub>2</sub> per tonne of production. Charts reproduced above.

**Cell:** G66

**Comment:** Rick Heede:

"At Cirebon (Indonesia), 18,000 tonnes of coal per year are saved by using 30,000 tonnes of rice husks. This makes a significant contribution to the plant's CO<sub>2</sub> reduction initiatives."  
Used tyres pictured.

**Cell:** G70

**Comment:** Rick Heede:

Use of alternative fuels in 2003-2004, of which 3.2 percent is biomass.

**Cell:** K70

**Comment:** Rick Heede:

HeidelbergCement CSR Rpt 2007, page 19, shows data on net and gross emissions, million tonnes CO<sub>2</sub> for 2003 - 2006.

**Cell:** E74

**Comment:** Rick Heede:

Heidelberg SustRpt 2009, page 37.

**Cell:** K74

**Comment:** Rick Heede:

HeidelbergCement CSR Rpt 2009. pg38

**Cell:** E76

**Comment:** Rick Heede:

AR 2010 pdf pg 48, cement and clinker sales. Excludes ready-mix concrete: 35.0 million tonnes in 2010.

**Cell:** K76

**Comment:** Rick Heede:

CSR 2009-10, pg 33, SR

**Cell:** AC79

**Comment:** Rick Heede:

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